APPENDIX C
ECONOMIC ANALYSIS OF STORM DAMAGE REDUCTION WITH RECREATION BENEFITS

SEGMENT II

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SEGMENT II

INTRODUCTION

C-1. The purpose of this appendix is to document the economic justification for Segment II of the Broward County Shore Protection Project. The appendix will identify potential losses that could occur from storms which could cause damages to residential, commercial and retail structures in the effected area along the Atlantic Ocean. It will further describe the derivation of the preliminary National Economic Development (NED) Plan, and, the benefits from the selected alternative plan of improvement based on the expected reduction in damages from storms. The analysis of the NED benefits is based on guidance contained in *ER 1105-2-100, Planning Guidance Notebook*. It is based on economic principles and analysis and reflects the assessment of damages and the benefits to be derived from engineering information provided in making the final conclusions and recommendations.

C-2. Broward County, Florida is located in the southeastern section of the state and is one of the South Florida coastal counties. It is bordered on its north by Palm Beach County, on the west by Collier County, on the south by Dade County and on the east by the Atlantic Ocean. It is about 30 miles south of the Lake Worth Inlet and about 60 miles west of Bimini, The Bahamas. The 24 mile coastline of Broward County consists of three coastal barrier islands west separated from the mainland by the Intracoastal Waterway (ICW). Broward County is among the largest counties in the state and occupies a land area of 1211 square miles. The largest city in the county is Ft. Lauderdale.

PREVIOUS STUDIES

C-3. The 1981 GDM states that the NED plan for Segment II is to extend the 1979 MHW 140 to 170 feet, depending on the section of beach (USACE, 1981). The annualized storm damage prevention and recreational benefits were calculated to be $2,247,000. The benefit to cost ratio was 1.5. The 1983 project extended the Federal project for Segment II from R32-R48+600 to R25-R53. In 1994, the Section 934 Reevaluation Report determined the NED plan for the Federal project to be a 175 foot extension of the ECL, which was established by the 1970 MHW in Pompano Beach and the 1983 MHW in Lauderdale-by-the-Sea. The benefit to cost ratio was found to be 5.4 (USACE, 1994).

C-4. The Coast of Florida Study (COFS), divided Segment II into two projects – Pompano Beach/Lauderdale-by-the-Sea and Ft. Lauderdale (USACE, 1996). The economic analysis for Pompano Beach/Lauderdale-by-the-Sea (R25 to R53) calls for a 35 foot extension of the 1988 Berm (+9.0 ft NGVD). The project yields a benefit to cost ratio of 1.6 and provides $1,319,600 of total annualized benefits. A 25 foot extension of the 1993 berm in Ft. Lauderdale (R53 to R74) will provide $2,005,200 of total annualized benefits. The benefit to cost ratio for this portion is 1.2. The COFS indicates that 64.3% of the Pompano Beach/Lauderdale-by-the-Sea project and 55.9% of the Ft. Lauderdale project qualified for Federal cost sharing.

DEFINITION OF THE STUDY AREA

C-5. For this appendix, the study area is divided into two portions that are defined as (1) the Federal project and (2) a modification to the Federal Project (Figure C-1). Reaches 1 (R25-35) and 2 (R36-53), as defined in Appendix A, are combined and will be considered as Pompano Beach/Lauderdale-by-the-Sea (the current Federal project). Ft. Lauderdale will be represented by Reach 3 (R54-74), defined in Appendix A, the proposed modification to the Federal project.

EXISTING PROBLEM IN THE STUDY AREA

C-6. The general problems are the socio-economic losses as well as losses in revenue to the County from potential storm damages to buildings and land along the Atlantic coastline. Erosion and the lowering of the beach profile along with periodic recession of the shoreline has threatened the quality of the coastline, thus, impacting the oceanfront infrastructure. The shoreline recession can potentially undermine the oceanfront structures. In addition, a part of Highway A1A is susceptible to severe damage and closure. If the shoreline recession is allowed to continue, there will be incidental repercussions to tourism and the local economy. This means lower tourism dollars, which in turn affects the tourist industry and all other business entities which depend on tourism for their livelihoods.

METHODOLOGY OF THE STUDY

C-7. This study will (1) reevaluate the existing Federal project in Pompano Beach/Lauderdale-by-the-Sea and (2) determine a preliminary NED plan for Ft. Lauderdale as a modification to the Federal project. To accomplish this, a Risk and Uncertainty Storm Damage Model (RU SDM) is used to determine storm damage and loss of land benefits provided by various shoreline extensions from an Erosion Control Line (ECL) or project baseline. The cost to build and maintain each shoreline extension used in the RU SDM are subtracted from the storm damage benefits to determine annualized net benefits. The preliminary NED plan is the shoreline extension from the project baseline that produces the largest annualized net benefits.

C-8. This appendix will address the following: describe the RU SDM; the input used for the RU SDM to reevaluate the Federal project; the new preliminary NED plan for the Federal project; RU SDM data used in the analysis of the modification to the authorized project (Ft. Lauderdale extension); the resulting preliminary NED plan for Ft. Lauderdale; and summarize the recommended plans.

THE STORM DAMAGE MODEL

C-9. The Institute for Water Resources has developed a Risk and Uncertainty Storm Damage Model (RU SDM Version 0.2) which simulates damages at existing and future years and determines average annual equivalent damages. The District provided a copy of the model to Broward County for use in this study. The model uses shoreline recessions, caused by background erosion and induced by storms, and structural data to compute expected damages to

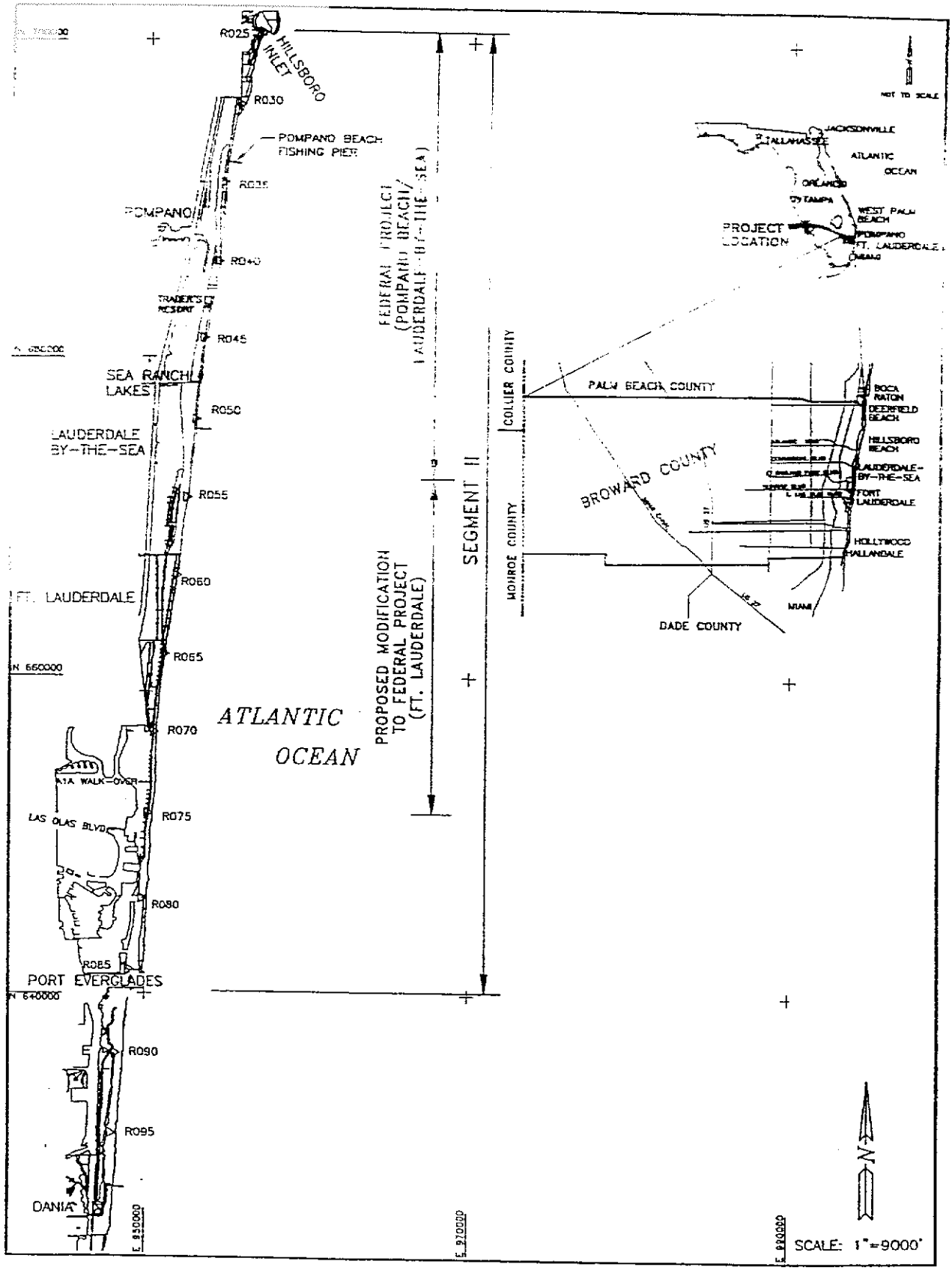


FIGURE C-1

SEGMENT II PROJECT LOCATION MAP

each structure. The model takes into account the risk and uncertainty of the input data to statistically determine the storm damage. For the purposes of analysis, storm damage is defined as the damage incurred by the loss of a given amount of shoreline as a direct result of erosion caused by a storm of a given magnitude and frequency. In addition to residential structures, storm damages were calculated for commercial and public buildings, roads, and associated utilities, seawalls, revetments, bulkheads, and the replacement of lost backfill.

C-10. The RU SDM can be used in a deterministic mode and a statistical mode. In deterministic mode, the model does not account for the risk and uncertainty of the input data. In this mode, the model produces similar results as earlier versions of the SDM. In statistical mode, the model runs a number of iterations (set by the user). The model will output data for each iteration and a running average of all of the iterations. The greater the number of iterations, the smaller the standard error of estimate. For this study, 3000 iterations were used and the standard error of estimate is near an asymptotic value. A seed number of 1701 was used, which allows the statistical results of the model to be reproduced.

C-11. Based upon erosion, storm recession, coastal armor and structure data, annualized equivalent damages for each project condition were calculated. Using this information, a frequency damage relationship was constructed for each year of the project life. The resulting estimates of expected damages were converted to an annual equivalent basis using an interest rate of 6.125 percent for the project life. The RU SDM is used to estimate the damage prevention benefits. First, the model is used to determine annualized equivalent damages for the project area if a project is not implemented and maintained (i.e., without project conditions). A project is defined as a maintained extension of a shoreline. The RU SDM is then used to calculate the annualized equivalent damages for various shoreline extensions (with project conditions). The differences in annualized equivalent damages between the with and without project conditions are the damage prevention benefits.

Storm Damage Model Inputs

C-12. A database for the project area is used to create the input files for the RU SDM. This section will qualitatively address the data that is necessary to create a RU SDM input file. Specific values used to reevaluate the Federal project and to evaluate proposed modifications to the Federal project are presented in subsequent sections. Input files used for this study are attached as Sub-Appendix C-1.

C-13. Existing and Future Shoreline Position. The assessment of damages to the existing development was based on present conditions. Continuous erosion and shoreline recession results in reduced beach width and thus reducing protection between a structure and the expected shoreline position.

C-14. Future year damages were simulated in the model by identifying and locating the shoreline in the future relative to the baseline. Future shorelines can exist in several forms: (1) held constant at one continuous value throughout the project life such as zero feet; (2) allowed to recede over the project life without any interference in the rate of erosion; and (3) allowed to recede at varying distances over the project life, for example, one-foot, three-feet and five feet per year. Without project erosion rates are discussed in Appendix A.

C-15. Storm Frequency-Recession Relationship. The storm frequency-recession relationships are the recession distances that a storm with the given probability (1/Return Period) will yield. Recession is defined as the most landward point that as storm causes a minimum of 0.5 ft vertical erosion. The storm frequency-recession relationship was derived using Empirical Simulation Technique (EST) which is described in Appendix A. SBEACH was used to determine the landward extent of erosion driven by 12 tropical and 13 extratropical storms.

C-16. Coastal Armor Protection. The RU SDM can account for various existing and future types of coastal armor. If coastal armor is present, the model presumes that the armor will halt background erosion indefinitely, but the armor only provides limited protection against storm recession. In the case that upland development is not protected by any armor or the armor fails, it is assumed that armor will be constructed to provide a protection against a potential storm event with a 2 year return period.

C-17. The level of protection provided by each coastal protective structure is based on engineering judgment and is presented in terms of the storm recession that each type of armor would prevent until it is undermined and fails. The replacement costs per linear foot of shoreline are based on engineering cost estimates. The damage factor represents a fraction of the total armor value that will be required to repair or replace the damaged armor. When a concrete sheetpile (CSP) structure is damaged it is considered unrepairable and needs to be completely replaced (i.e., 100% damage factor). Rubble revetment structures were assumed to be repairable if less than 35% of the structure is damaged.

C-18. The locations and types of coastal armor were assessed using aerial photographs, past studies, and design drawings. Field inspections were made to determine the types of coastal armor and it was found that CSP is the type of seawall used (USACE, 1996). Since the 1996 study, no changes have been made to the seawalls.

C-19. Backfill Cost. If a storm broaches coastal armor, the cost to replace the backfill is taken into account. The RU SDM assumes that the backfill is placed to a depth of 3 feet from the existing ground level. The cost of backfill is in terms of dollars per square foot.

C-20. Structure Improvement Values. Structural improvement values were obtained from the Broward County Tax Appraiser's Office and were reviewed by the Jacksonville District Real Estate Division. The value of structural improvements is the replacement value less depreciation. The model limits damages to the structure to the first two stories.

C-21. Parcel Width. The width of the parcel is used to determine the land loss value from background erosion. The RU SDM assumes that the parcel extends landward for an infinite distance.

C-22. Number of Floors. Since the RU SDM limits damages to the first two stories of multiple story structures, the total number of stories is needed. The RU SDM linearly determines the value of the first two stories based upon the total structure value and the total number of floors.

C-23. Physical Dimensions. The model requires the shorefront width of each coastal parcel for several calculations. This information was measured from aerial photographs or past studies. Controlled aerial photographs were used to determine the distance of each structure from the baseline. The following

distances were measured to define the location of development relative to the project baseline for the study area:

a. The distance to existing or future coastal armor,
b. The distance to the seaward edge of buildings, and
c. The distance to the center of the structure, or back of structure if it is a public building or constructed on piles.

C-24. Type of Structure. The RU SDM can apply different land loss values ($/ft^2) to privately owned parcels and public parcels. Furthermore, the parcel's land loss can be discounted. If a parcel is public, but over ¼ mile from an accessible point, the land loss is not counted. The four classifications accepted by the RU SDM are PC, PN, VC, and VN. The first letter indicates if the parcel is public (P) or private (V). The second letter indicates if the land loss value is to be counted (C) or not counted (N).

C-25. Independent Land Value. The RU SDM is able to assign a land value ($/ft^2) other than the private or public land values that are assigned by the RU SDM's parameters. For this study, this option is not exercised.

C-26. Duplicate Lot. Often, there are two or more rows of structures that are impacted by background erosion and/or storm recessions. To prevent erroneous land loss impacts, the parcels that are landward of another parcel are not included in the land loss calculation.

C-27. A second data file that is used contains the risk and uncertainty data. The data files used for this study are presented in Sub-Appendix C-1 and are qualitatively described below.

C-28. Shoreline Position. This is the standard deviation associated with the shoreline position. The RU SDM applies a normal distribution to the shoreline position. Each iteration the model randomly selects a shoreline position within the normal distribution with the given standard deviation.

C-29. Armor and Structure Cost Uncertainty. This parameter is associated with the unit cost of the protective armor and the structure values. The model internally calculates the standard deviation associated with each armor unit cost and each structure value given in the input file.

C-30. Setback Distances. The model applies a normal distribution to the distances from the armor and structure to the baseline. These are the distances described as the Physical Dimensions above. The normal distribution is based upon a standard deviation of the measured distances.

C-31. Backfill Cost. The RU SDM randomizes the unit costs of the backfill with a normal distribution. The mean value is unit cost previously addressed and the standard deviation is assigned in this risk data file.

C-32. Storm Frequency Recessions. The number of storm return periods and associated shoreline recessions is given in the risk data file. This must be the same number the storm recessions determined from EST analysis described in Appendix A and used in the main data file described above. The

standard deviation for each return period is given. The standard deviations were calculated as a part of the EST analysis.

C-33. Coastal Armor Protection. The level of protection provided by the coastal armor is based upon the recession of a storm with a given return period as described above. This variable is randomized using a uniform distribution. The end points of the distribution are assigned in the risk data file. The end point values each type of armor are +-25% of the level of protection given in the main data file. The model randomly selects a value in this range of uniform distribution.

Model Assumptions

C-34. Assumptions used in the development of an estimate of annual storm damages are as follows:

a) the relationship of probability to shoreline recession will remain constant with time,

b) damages to structures will not occur until shoreline recession has exceeded the seaward edge of the structure,

c) when the shoreline recedes halfway through a structure, the structure is considered a total loss as in the case of a single family home,

d) when the shoreline recedes halfway through a structure with more than two stories such as high-rise condominiums, the structure value of only the bottom two floors is considered lost,

e) if a structure is less than one-half undermined, the damage is assumed to be equal to the product of the structure value and the ratio of the horizontal distance eroded through the structure divided by the mid-point of the distance through the structure,

f) all market values of structures are estimated by using the cost approach to value known as Replacement Cost New less Depreciation,

g) content damage is not evaluated,

h) seawalls, revetment and other coastal armor types halt all damage from a given storm until failure. The structure is assumed lost when the volume of scour in front of the structure is sufficient to allow structural failure,

i) although shorefront areas continue to develop through time, damage estimates are limited to existing buildings and structures,

j) repair costs to the coastal armor and the cost of backfill are determined by current engineering estimates of replacement and/or repair cost of such work,

k) after structure failure, the shorefront development, roads, parking lots etc., will be repaired to a condition similar to and in the same location as the without project conditions,

m) the local property owners will protect their own properties to at least a 2-year storm event.

REEVALUATION OF FEDERAL PROJECT

C-35. In this study, the preliminary NED Plan for the Federal project (Pompano Beach/Lauderdale-by-the-Sea) has been reevaluated using the RU SDM described above. This reevaluation is based on the existing project not being in place, all dredged sand is back in the original borrow areas and a project life of 50 years. An interest rate of 6.125% was used. A RU SDM input data file was created to determine the storm damage prevention benefits. The reevaluated preliminary NED Plan width for the Federal project is a 100 foot extension of the ECL/Baseline. The details of this formulation are addressed below. The input data files are shown in Sub-Appendix C-1.

Storm Damage Model Input

C-36. Existing and Future Shoreline Positions. The existing shoreline is taken as the 1970 ECL in Pompano Beach and a project baseline for Lauderdale-by-the-Sea. An ECL was established for Lauderdale-by-the-Sea in 1983, but it is much further seaward than Pompano Beach's ECL, so a project baseline that is equivalent to the Pompano Beach 1970 ECL was used. Details of selecting this baseline are addressed in the project baseline section of Appendix A and consultation with the District was performed.

C-37. Future shoreline positions, relative to the ECL/baseline, are based on the background erosion rate. Based on historic, pre-project erosion rates, the shoreline for Pompano Beach/Lauderdale-by-the-Sea erodes at a rate of 4.0 ft/yr (Appendix A). Based on the 1983-1998 beach profile data, the spatial variability (standard deviation) of the erosion is 3.6 ft/yr. Since the temporal variability is unknown, the temporal variability was assumed equal to the spatial variability.

C-38. Storm Frequency-Recession. Based upon a representative beach profile, SBEACH modeling, and applying an empirical simulation technique (EST), a probabilistic storm recession relationship was developed. Storm recession for storm return periods 1 to 200 years were used in this reevaluation (Table C-1). The high frequency storms have significantly smaller recession values than past reports. Previous studies have used EDUNE to determine the storm recession values, whereas SBEACH was used in this reevaluation (Appendix A).

Table C-1

EST Storm Recessions

Return Period (yrs)	Pompano Beach/LBTS (Federal Project)		Ft. Lauderdale (Modification to Federal Project)	
	Mean Recession (ft)	Standard Deviation (ft)	Mean Recession (ft)	Standard Deviation (ft)

1	18	1	18	3
2	29	2	19	5
5	55	6	31	7
10	73	18	45	37
20	95	23	85	33
50	137	46	122	33
100	162	47	146	31
200	190	61	163	36

C-39. Coastal Armor Protection. Based on engineering judgment, the coastal armor was grouped based upon the level of protection is provides. The armor was, generally, either capped concrete sheet pile (CSP) or rubble revetment. Both of these armor types will protect the landward property and dwellings up to a 5-year storm event, unless the armoring is exceptionally large or small. The small CSP seawalls were determined to provide a level of protection only against a 2-year storm event. The large CSP seawalls provide protection against a 10 year storm event. It is assumed that a 2 year CSP seawall will be constructed when existing armor is destroyed. If armor is not present and the shoreline recedes landward of the property setback distance, a 2 year CSP seawall will be constructed to protect upland structures from damage resulting from storm and shoreline recessions.

Storm Damage Reduction Benefit Analysis

C-40. The RU SDM was used to determine storm damages that would occur if a Federal project were not in place. The annualized damages are $26,001,000 (Table C-2). The RU SDM is then used to determine storm damages that result when a Federal project is in place. A Federal project is defined as a beach width extension to the ECL/baseline that will be maintained throughout the project life. The preliminary NED width at 100 ft. is bracketed by 75 and 125 ft. plan widths.

Table C-2

Annualized Storm Damage Benefits for Pompano Beach/ LBTS Federal Project

Damages – Mean					
Project	Structural	Armor	Backfill	Land Loss	Total
w/o	$19,361,000	$4,680,000	$319,000	$1,614,000	$26,001,000
75 ft	$1,158,000	$189,000	$18,000	$0	$1,365,000

100 ft	$626,000	$107,000	$10,000	$0	$743,000
125 ft	$318,000	$59,000	$6,000	$0	$383,000

Benefits – Mean

Project	Structural	Armor	Backfill	Land Loss	Total
75 ft	$18,203,000	$4,491,000	$301,000	$1,641,000	$24,636,000
100 ft	$18,735,000	$4,573,000	$309,000	$1,641,000	$25,258,000
125 ft	$19,043,000	$4,621,000	$313,000	$1,641,000	$25,618,000

Benefits – 95% Confidence Intervals

Project	Lower Bound	Upper Bound
75 ft	$9,849,000	$37,873,000
100 ft	$9,849,000	$39,440,000
125 ft	$9,849,000	$40,461,000

C-41. Storm damage reduction benefits are the dollar amount of potential storm damage that is prevented by the addition of beach extensions. The storm damage reduction benefits (Development Benefits) are the without project storm damage less the storm damages for the added widths (Table C-2). The storm damage reduction benefits increase as the project width increases. The further the beach is extended, the less damage to upland development will result from storm recession. The upland development damage includes damages and replacement costs to structures, coastal armor, and backfill (the fill landward of coastal armor), which result from probabilistic storm recessions during the project life. Upland structures that are within a 2 year storm recession of the ECL/baseline are condemned once damaged beyond half of the replacement value. For Pompano Beach/LBTS the condemnation distance is 29 feet, which is the 2 year storm recession. It is assumed that a property owner will not replace a structure if it needs rebuilding every 2 years or less.

Loss of Land Benefit

C-42. Another primary benefit of a shore protection project is a reduction in loss of land. Long-term shoreline recession can be determined from beach profile surveys or other historical records. These trends are used to calculate the surface area of land that is expected to be lost over the economic period of analysis. A reduction or halt of long-term shoreline recession which is attributable to a shore protection project provides the basis for calculating an economic benefit.

C-43. Benefits derived from stabilizing the shoreline result from halting the amount of land being lost to long-term shoreline recession. To determine the value of the benefit, the value of the lands being lost must be determined. An economic evaluation of the value of private land losses that occur during each year is used to develop an annual equivalent value. The annual equivalent value is compared for existing without project and with project conditions to determine the magnitude of any shoreline stability benefit. The loss of land benefit for the Federal project area is $1,641,000. This value is added to the storm damage prevention benefit to obtain the total primary benefits for the Federal project (Table C-2).

C-44. The value of the lands used in the analysis was determined according to Engineering Regulation 1165-2-130 which requires that fair market value nearshore land be used in the analysis. Nearshore land is defined in the regulation as "land that is sufficiently removed from shore to lose its significant increment of value because of its proximity to the shore, when compared to adjacent parcels that are more distant from shore."

C-45. The nearshore land value for the Segment II project area was determined using the 1998 Broward County Tax Appraiser data base. The average nearshore land value for the Segment II project area is $25.00 per square foot. This value is consistent with other "nearshore land" values in the southeast region of Florida.

C-46. The evaluation of shoreline stability benefits along public shores (non-Federal) must reflect the special use for which the land is dedicated. Normally, public shores are dedicated for parks or conservation areas. The benefit derived from stabilizing these shores is related to expected losses in recreational activity. Therefore, shoreline stability benefits along public shores must be claimed as incidental benefits. The expected loss of both public and private lands is limited to that portion of shorefront properties lying between the pre-project mean high water line and the existing or future line of coastal armor.

Summary of the Reevaluated Federal Project

C-47. The preliminary NED plan is the added beach width that produces the maximum net benefits and is determined by comparing the storm damage benefits and project costs for various ECL/baseline extensions. To reevaluate the authorized project, project costs and primary benefits were calculated for ECL/baseline extensions of 25 foot increments bracketing the 100 foot beach extension. The optimized renourishment cycles which are 5 years for each width were used in the cost analysis (Appendix A). The project life is 50 years. The interest rate used in this study is 6.125%. The net benefits are determined by subtracting the annualized costs to build and maintain a project from the annualized primary benefits provided by the project. The annual project costs were developed in Appendix A and are shown in Table C-3.

Table C-3

Annualized Pompano Beach Federal Project Benefits and Costs

Added Shoreline Width (ft)	Development Benefits	Land Loss Benefits	Total Primary Benefits	Project Costs	Net Benefits
75	$22,995,000	$1,641,000	$24,636,000	$3,516,000	$21,120,000
100	$23,617,000	$1,641,000	$25,258,000	$3,984,000	$21,274,000
125	$23,977,000	$1,641,000	$25,618,000	$4,530,000	$21,088,000

C-48. The preliminary NED width for Pompano Beach/LBTS (FDEP monuments R26-R53) is a 100 foot ECL/baseline extension (Table C-3). The project extension that yields the maximum net benefit, which is 100 feet, is the preliminary NED plan. For Pompano Beach/LBTS, the maximum annualized net benefit is $21,274,000. The annualized primary benefits are $25,258,000. The annualized cost to build and maintain the preliminary NED plan of 100 feet for 50 years is $3,984,000. As indicated in Appendix A, the preliminary NED plan was not permittable. For Pompano Beach/LBTS, a reduction in the advanced nourishment was necessary to achieve a permittable project. No change in the design width was required. Therefore, the 100 foot extension of the ECL/baseline is the NED plan.

MODIFICATION TO THE FEDERAL PLAN

C-49. A separate preliminary NED plan width was also developed for the northern portion of Ft. Lauderdale (FDEP monuments R53-R74) using the same procedure as was used in Pompano Beach/Lauderdale-by-the-Sea with the exception that the project life was limited to 18 years. RU SDM input data files were created to determine the storm damage prevention benefits. The preliminary NED Plan width for the Ft. Lauderdale modification to the Federal project is a 25 foot extension of the baseline (1998 MHW) and extends from R53 to R74. The NED plan width is a 20 foot extension of the baseline between R-53 and R-71. The details of this formulation are addressed below.

Storm Damage Model Input

C-50. Existing and Future Shoreline Positions. Future shoreline positions, relative to the existing shoreline position (1998 MHW baseline), are based on the background erosion rate. Based on historic, pre-project erosion rates, the shoreline for northern Ft. Lauderdale erodes at a rate of 1.0 ft/yr (Appendix A) with a standard deviation of 1.8 ft/yr.

C-51. Storm Frequency-Recession. Based upon a representative beach profile, SBEACH modeling, and applying an empirical simulation technique (EST), a probabilistic storm recession relationship was developed. Storm recession for storm return periods 1 to 200 years were used in this reevaluation (Table C-1). The high frequency storms have significantly smaller recession values than past reports.

Previous studies have used EDUNE to determine the storm recession values, whereas SBEACH was used in this analysis (Appendix A).

C-52. Coastal Armor Protection. Based on engineering judgment, the coastal armor was grouped based upon the level of protection is provides. The armor was, generally, either capped concrete sheet pile (CSP) or rubble revetment. Both of these armor types will protect the landward property and dwellings up to a 5 year storm event, unless the armoring is exceptionally large or small. The small CSP seawalls were evaluated to provide a level of protection only against a 2-year storm event. The large CSP seawalls provide protection against a 10-year storm event. It is assumed that a 2-year CSP seawall will be constructed when existing armor is destroyed. If armor is not present and the shoreline recedes landward of the property setback distance, a 2-year CSP seawall will be constructed to protect upland dwellings from damage resulting from storm and shoreline recessions.

C-53. Highway A1A travels along the beach for much of Ft. Lauderdale. Between the beach and the roadway, there is a sidewalk and a "seawall." After reviewing highway, sidewalk, and seawall cross sections, it is evident that the "seawall" is not an armoring structure. The short seawall sits on a spread footer; hence the sidewalk and seawall will fail if there is more than 5 ft of storm induced erosion landward of the structure. Because the sidewalk/"seawall" are not privately owned, it is assumed that the sidewalk/"seawall" will be continually replaced, if destroyed.

Storm Damage Reduction Benefit Analysis

C-54. The RU SDM was used to determine storm damages that would occur if the proposed modification to the Federal project is not implemented. This is the without Federal project condition, which is $3,721,000 for the preliminary NED plan (R-53-R-74) and $3,576,000 for the NED plan (R-53-R-71). The RU SDM is then used to determine storm damages that result when a Federal project is in place. A Federal project is defined as an extension to the baseline that will be maintained throughout the project life. Tables C-4a and C-4b shows the storm damages for baseline extensions of 1, 20, 25, and 50 feet.

Table C-4a

Annualized Storm Damage Benefits for Ft. Lauderdale, R-53 to R-74

Damages – Mean					
Project	Structural	Armor	Backfill	Land Loss	Total
w/o	$2,137,000	$429,000	$19,000	$1,136,000	$3,721,000
1 ft	$1,460,000	$241,000	$13,000	$0	$1,714,000
25 ft	$664,000	$127,000	$7,000	$0	$798,000
50 ft	$244,000	$55,000	$3,000	$0	$302,000
Benefits – Mean					
Project	Structural	Armor	Backfill	Land Loss	Total
1 ft	$677,000	$188,000	$6,000	$1,136,000	$2,007,000
25 ft	$1,473,000	$302,000	$12,000	$1,136,000	$2,923,000
50 ft	$1,893,000	$374,000	$16,000	$1,136,000	$3,419,000

Benefits – 95% Confidence Intervals		
Project	Lower Bound	Upper Bound
1 ft	$43,000	$4,064,000
25 ft	$43,000	$6,468,000
50 ft	$43,000	$8,065,000

Table C-4b

Annualized Storm Damage Benefits for Fort Lauderdale, R53 to R71

Damages - Mean					
Project	Structural	Armor	Backfill	Land Loss	Total
w/o	$2,057,000	$370,000	$19,000	$1,130,000	$3,576,000
20 ft	$767,000	$138,000	$8,000	$0	$913,000
Benefits - Mean					
Project	Structural	Armor	Backfill	Land Loss	Total
20 ft	$1,290,000	$232,000	$11,000	$1,130,000	$2,663,000

Benefits - 95% Confidence Intervals		
Project	Lower Bound	Upper Bound
20 ft	$43,000	$5,774,000

C-55. Storm damage reduction benefits are the dollar amount of potential storm damage that is prevented by the addition of beach extensions. The storm damage reduction benefits are the without project storm damage less the storm damages for the added shoreline widths (Table C-4). The storm damage reduction benefits increase as the project width increases. The further the beach is extended, the less damage to upland development will result from storm recession. The upland development damage includes damages and replacement costs to structures, coastal armor, and backfill (the fill landward of coastal armor), during the project life. Upland structures that are within a 2 year storm recession of the baseline are condemned once damaged beyond half of the replacement value. For Ft. Lauderdale, the condemnation distance is 19 feet, which is the 2 year storm recession. It is assumed that a property owner will not replace a structure if it needs to be rebuilt every 2 years or less.

Loss of Land Benefit

C-56. The nearshore land value for Ft. Lauderdale is also $25.00 per square foot. This value was determined for Segment II, which includes Pompano Beach/Lauderdale-by-the-Sea and Ft. Lauderdale. A detailed discussion of loss of land benefit was presented in the previous section (Reevaluation of the Authorized Project).

Project Width and Length

C-57. The preliminary NED plan width was evaluated using the costs (Appendix A) and benefits (Table C-5) based on the project terminating at monument R74. The preliminary NED width was 25 feet. The NED plan width is 20 feet, representing a permittable project ending at monument R-71. The optimal length of the preliminary NED plan was determined by increasing the length of the project in 5,000 foot increments to the inlet. South of R74 the beach is accretional and the upland development is further from the existing shore than north of R74. Therefore, no additional storm damage prevention or loss of land benefits are anticipated. Table C-5 addresses the net benefits for various project lengths. The net benefit is $1,349,000 for the preliminary NED plan and $1,376,000 for the NED plan.

Table C-5
Annualized Ft. Lauderdale Primary Project Benefits and Costs

Added Shoreline Width (ft)	Terminating Monument	Development Benefits	Land Loss Benefits	Total Primary Benefits	Project Costs	Net Benefits
1	R-74	$871,000	$1,136,000	$2,007,000	$1,016,000	$991,000
25	R-74	$1,787,000	$1,136,000	$2,923,000	$1,574,000	$1,349,000
50	R-74	$2,283,000	$1,136,000	$3,419,000	$2,202,000	$1,217,000
25	R-79	$1,787,000	$1,136,000	$2,923,000	$2,037,000	$886,000
25	R-84	$1,787,000	$1,136,000	$2,923,000	$2,231,000	$692,000
20	R-71	$1,533,000	$1,130,000	$2,663,000	$1,287,000	$1,376,000

Summary Of Modifications to the Reevaluated Federal Plan

C-58. The NED plan for Ft. Lauderdale (FDEP monuments R53-R71) was developed extending the baseline to 20 feet. The project costs (Appendix A) and benefits were annualized using an interest rate of 6.125%. The project costs are based on the optimal renourishment interval for each width. The project life for this modification is 18 years, the remaining time of the Federal authorization from the estimated construction year of 2002.

C-59. The NED width for Ft. Lauderdale is a 20 foot extension of the baseline, which is the maximum project extension that is permittable. The NED plan extends from R54 to R71. For Ft. Lauderdale, the maximum annualized net benefit is $1,376,000 (Table C-5). The annualized primary benefits are $2,663,000. The cost to build and maintain this project is $1,287,000 (Appendix A).

COMBINED REEVALUATION AND MODIFICATION OF THE FEDERAL PROJECT

C-60. The total primary benefits of the combined reevaluation and modification to the Federal project were evaluated. The annualized primary benefit of the 100 ft project in Pompano Beach/ LBTS and 20 ft project in Ft. Lauderdale is $25,533,000. The average annual benefit of $25,558,000 for the reevaluated Federal project and $2,663,000 for Ft. Lauderdale were combined as a single project. The base year present worth for the average annual benefits were determined for each project year, then summed together and annualized over 50 years (Table C-6). The average annual benefit for this scenario is $25,533,000 (Table C-6).

INCIDENTAL BENEFIT ANALYSIS

C-61. Recreational benefits are the most common incidental benefit produced by a shore protection project. These benefits result from an increased capacity for a recreational activity with an existing or expected surplus demand (which may be limited by public parking and access). The new beach surface produced by a beach nourishment project increases the capacity for recreational beach activity. All recreational benefits are considered incidental and do not influence optimization of the project design. Procedures for the evaluation of recreational benefits are described in Engineering Regulation 1105-2-100.

C-62. Engineering Regulation 1105-2-100 provides guidance and procedures for the evaluation of recreation benefits. Acceptable evaluation procedures described in this regulation have the following characteristics:

a. The evaluation is based on an empirical estimate of demand applied to the particular project.
b. Estimates of demand reflect the socio-economic characteristics of market area populations, recreation resources under study, and existing alternative recreation opportunities.
c. The evaluation must account for the value of losses or gains to existing sites in the study area and alternative recreation opportunities.

Table C-6

Combined Reevaluation and Modification of the Federal Project Pompano Beach/LBTS and Ft. Lauderdale Primary Benefits

Project Year	Pompano Beach to LBTS		Ft. Lauderdale	
	Average Annual Benefit	Present Worth at Base Year	Average Annual Benefit	Present Worth at Base Year
1	$25,258,000	$23,800,236		
2	$25,258,000	$22,426,606		
3	$25,258,000	$21,132,255		
4	$25,258,000	$19,912,608		
5	$25,258,000	$18,763,353		
6	$25,258,000	$17,680,427		
7	$25,258,000	$16,660,001		
8	$25,258,000	$15,698,470		
9	$25,258,000	$14,792,434		
10	$25,258,000	$13,938,689		
11	$25,258,000	$13,134,218		
12	$25,258,000	$12,376,177		
13	$25,258,000	$11,661,887		
14	$25,258,000	$10,988,821		
15	$25,258,000	$10,354,602		
16	$25,258,000	$9,756,987		
17	$25,258,000	$9,193,862		
18	$25,258,000	$8,663,239		
19	$25,258,000	$8,163,241		
20	$25,258,000	$7,692,100		
21	$25,258,000	$7,248,150		
22	$25,258,000	$6,829,824		
23	$25,258,000	$6,435,641		
24	$25,258,000	$6,064,208		
25	$25,258,000	$5,714,212		
26	$25,258,000	$5,384,417		
27	$25,258,000	$5,073,655		
28	$25,258,000	$4,780,830		
29	$25,258,000	$4,504,904		
30	$25,258,000	$4,244,904		
31	$25,258,000	$3,999,909		
32	$25,258,000	$3,769,055		
33	$25,258,000	$3,551,524	$2,663,000	$374,444
34	$25,258,000	$3,346,548	$2,663,000	$352,833
35	$25,258,000	$3,153,402	$2,663,000	$332,469
36	$25,258,000	$2,971,404	$2,663,000	$313,281
37	$25,258,000	$2,799,909	$2,663,000	$295,200
38	$25,258,000	$2,638,313	$2,663,000	$278,162
39	$25,258,000	$2,486,042	$2,663,000	$262,108
40	$25,258,000	$2,342,561	$2,663,000	$246,981
41	$25,258,000	$2,207,360	$2,663,000	$232,726
42	$25,258,000	$2,079,962	$2,663,000	$219,294
43	$25,258,000	$1,959,917	$2,663,000	$206,638
44	$25,258,000	$1,846,801	$2,663,000	$194,712
45	$25,258,000	$1,740,213	$2,663,000	$183,474
46	$25,258,000	$1,639,776	$2,663,000	$172,885
47	$25,258,000	$1,545,137	$2,663,000	$162,907
48	$25,258,000	$1,455,959	$2,663,000	$153,505
49	$25,258,000	$1,371,929	$2,663,000	$144,645
50	$25,258,000	$1,292,748	$2,663,000	$136,297
Total		$391,269,424		$4,262,561
Total Base Year Worth	$395,531,985			
Annualized Total Benefit	$25,533,165			
Interest Rate	6.125%			

d. Willingness to pay is evaluated by either the travel cost method, contingent valuation method, or day value method.

Annual Beach Activity Demand

C-63. Annual beach activity demand must be determined over the economic life of the project to analyze recreational benefits. This is primarily accomplished by collecting existing beach use data and relating it to current populations. The Florida Department of Environmental Protection performs such studies to determine the recreational needs of residents and tourists. The annual beach activity demand for Segment II is calculated for the existing Federal project area in Pompano Beach/Lauderdale-by-the-Sea (FDEP R25 to R53), and modification to the Federal project area in Ft. Lauderdale (FDEP R53 to R71) (Tables C-7 and C-8).

C-64. Annual per capita participation rates for beach activity in Broward County were obtained from the Reevaluation Report Section 934 Study for Broward County (USACE, 1994). The rates for Broward County residents and out-of-state tourists are 4.567 and 3.092 respectively. The rates for other Florida residents is 0.19. The per capita participation rates are assumed to remain constant throughout the economic period of analysis.

C-65. County and State population data for the Federal project (Pompano Beach/LBTS) area for the years 1970, 1980, and 1990 were obtained from the 1971, 1981, and 1991 "Florida Statistical Abstract." Population projections for the years 2000, 2002, 2010, and 2020 were obtained from the 1998 "Florida Statistical Abstract" (Tables C-7 and C-8). Tourist population projections for the Federal project and the modification to the Federal project were obtained from the Broward County Reevaluation Report Section 934 Study (USACE, 1994) for the years 1990 to 2020. The 1980 tourist population was obtained from the Broward County, Port Everglades to South County Line, G&DDM (USACE, 1979) for Reaches 1 and 2. The 1970 tourist population was linearly extrapolated from the given data.

C-66. The annual beach activity demand for each reach of Broward County is a combination of the demand that is generated by Broward County residents, other State of Florida residents, and tourists. The demand that is generated for Broward County residents, other State of Florida residents, and tourists is determined by multiplying the annual per-capita participation rates by their respective populations. The total beach activity demand for the Federal project and the modification to the Federal project in Broward County is a summation of these components (Tables C-7 and C-8).

C-67. The annual beach activity demand is a percentage of the total beach activity demand for all the public shores in Broward County. In 1995-1996 Broward County's Department of Natural Resource Protection determined the visits to Broward County Beaches by beach segment. The report determined that 53% of the total beach visits occurred in Segment II. This percentage was further refined to determine the percentage of beach visits for the Federal project area and the modification to the Federal project. The Federal project area (Pompano Beach/LBTS) was estimated to have 24.9% of the total Segment II beach visits. The modification to the Federal project (Ft. Lauderdale R-53 to R-71) has 12% of the total visits.

TABLE C-7

BROWARD COUNTY, SEGMENT II
EXPECTED BEACH ANNUAL ACTIVITY DEMAND ANALYSIS
POMPANO BEACH/LBTS (FEDERAL PROJECT)
(ALL NUMBERS IN THOUSANDS)

ITEM	YEAR					
	1970	1980	1990	2000	2010	2020
COUNTY POPULATION (1)	620	1014	1256	1493	1708	1927
TOURIST POPULATION (2)	1674*	3161**	3221	4708	6195	7681
FLORIDA POPULATION (1)	6789	9740	12938	15513	17928	20409
DEMAND: (3)						
COUNTY(VISITS)	2832	4631	5734	6819	7800	8799
TOURISTS(VISITS)	5176	9774	9959	14557	19155	23750
FL. RESIDENTS(VISITS)	1290	1851	2458	2947	3406	3878
TOTAL DEMAND(VISITS)	9298	16255	18151	24323	30361	36426
PROJECT AREA DEMAND (4)	2315	4048	4520	6056	7560	9070

(1) FLORIDA STATISTICAL ABSTRACT (1971, 1981 1991,1998).

(2) TOURIST POPULATION DATA FROM THE BROWARD COUNTY SEGMENT II REEVALUATION REPORT (USACE 1994).
* TOURIST POPULATION DATA LINEARLY EXTRAPOLATED FOR 1970.
** TOURIST POPULATION DATA FROM BROWARD COUNTY G&DDM (USACE 1979).

(3) SALTWATER BEACH PER CAPITA PARTICIPATION RATES FROM REEVALUATION REPORT SECTION 934 STUDY FOR BROWARD COUNTY (USACE 1994).

RESIDENT PER CAPITA RATE	4.567
TOURIST PER CAPITA RATE	3.092
OTHER FLORIDA RESIDENTS RATE	0.19

(4) 24.9 % OF THE TOTAL DEMAND OCCURS BETWEEN R25 AND R53 (BCDNRP 95-96).

TABLE C-8

BROWARD COUNTY, SEGMENT II
EXPECTED BEACH ANNUAL ACTIVITY DEMAND ANALYSIS
FORT LAUDERDALE (MODIFICATION TO FEDERAL PROJECT)
(ALL NUMBERS IN THOUSANDS)

ITEM	YEAR		
	2002	2010	2020
COUNTY POPULATION (1)	1536	1708	1927
TOURIST POPULATION (2)	5005	6195	7681
FLORIDA POPULATION (1)	15996	17928	20409
DEMAND: (3)			
COUNTY(VISITS)	7015	7800	8799
TOURISTS(VISITS)	15477	19155	23750
FL. RESIDENTS(VISITS)	3039	3406	3878
TOTAL DEMAND(VISITS)	25531	30361	36426
PROJECT AREA DEMAND (4)	3064	3643	4371

(1) FLORIDA STATISTICAL ABSTRACT (1998).
(2) TOURIST POPULATION DATA FROM THE BROWARD COUNTY SEGMENT II REEVALUATION REPORT (USACE 1994).
(3) SALTWATER BEACH PER CAPITA PARTICIPATION RATES FROM REEVALUATION REPORT SECTION 934 STUDY FOR BROWARD COUNTY (USACE 1994).

RESIDENT PER CAPITA RATE	4.567
TOURIST PER CAPITA RATE	3.092
OTHER FLORIDA RESIDENTS RATE	0.19

(4) 12.0 % OF THE TOTAL DEMAND OCCURS BETWEEN R53 AND R71 (BCDNRP 95-96).

The remaining 15.9% occur south of the project area. The annual beach activity demand for the project area in each reach is shown in Tables C-7 and C-8.

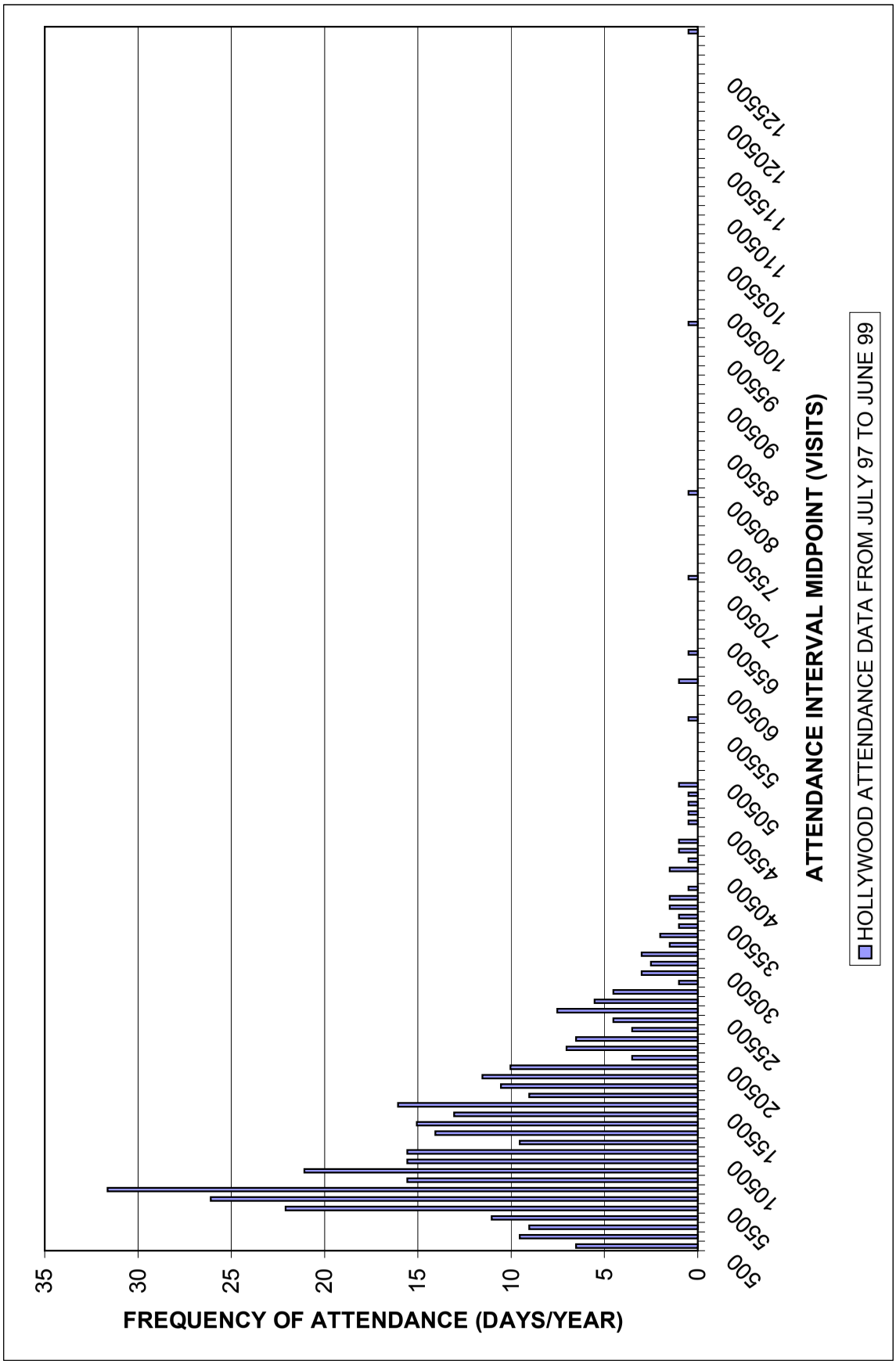
Daily Beach Activity Demand

C-68. Daily beach activity demand varies considerably from day to day with the greatest demand occurring on weekends, holidays, or other special occasions. The variation in daily demand is also dependent on the time of year since tourist demand can be a major component. The distribution pattern of daily beach activity demand is determined by performing a frequency analysis on actual beach activity in the project area whenever possible. Once this pattern is determined, annual beach activity demand can be distributed confidently into daily demand.

C-69. A frequency analysis was performed to determine the distribution of daily beach activity demand. A daily log of observed beach activity was obtained from the City of Hollywood's Fire and Rescue Beach Safety Division for the City of Hollywood public beach. Since approximately 20% of the visits to Broward County beaches occurs at the City of Hollywood Beach (BCDNRP 1996), it is assumed that the resulting frequency analysis is a good indicator for the frequency of beach attendance at all of the Broward County public beaches. Therefore, this analysis can be used to determine the demand distribution for the Federal project and the modification to the Federal project in Segment II. The log consisted of daily (once a day) beach counts for the City of Hollywood Beach from July 1997 to June 1999. Based on the high beach attendance volume from the daily reports, an interval of 1000 visits was chosen for the analysis. The frequency distribution of daily beach activity is shown in Figure C-2.

C-70. Daily beach activity capacity is a measure of the maximum number of people that can recreate on a beach in a single day. Beach capacity is primarily based on the amount of dry beach that is available to the recreational beach visitor. Limitations on beach capacity are imposed by public access and parking. Also, visitors that are walk-ons, cyclists, drop-offs or from buses were considered. Daily beach activity capacity for the Federal project and the modification to the Federal project are shown in Tables C-9 and C-10 for without project conditions. Tables C-11 and C-12 show the daily beach activity capacity for both sections with NED plan widths of 100 feet for Pompano Beach/LBTS and 20 feet for Ft. Lauderdale. It should be noted that the "with project" daily beach capacities will remain constant throughout the life of the project for each shoreline extension. This is based on the assumption that the beach will be renourished prior to the erosion of the design shoreline. Therefore, a long term erosion rate of 0 feet per year is assumed for the with project condition.

C-71. Dry beach surface area is the most important factor in determining daily beach capacity. Dry beach surface area is determined by multiplying the public access lot length by the dry beach width, which is measured between mean high water and the base of the dune or vegetation line, whichever is more seaward. Studies by the U.S. Army Corps of Engineers and the Florida Department of Environmental Protection have determined that approximately 100 square feet of dry beach is required for normal beach activity by the average person. The daily beach capacity, based on the dry beach surface area, is determined by dividing the dry beach surface area by 100 square feet per person and multiplying by a daily turnover rate of 2.



BEACH ACTIVITY DEMAND DISTRIBUTION FIGURE C-2

FOR BROWARD COUNTY

TABLE C-9

BROWARD COUNTY, SEGMENT II
POMPANO BEACH/LBTS (FEDERAL PROJECT)
BEACH CAPACITY WITHOUT PROJECT

DESCRIPTION	PUBLIC PARKING SPACES	NOTIONAL PARKING	PARKING & NOTIONAL CAPACITY (VISITS)	PUBLIC SHORE FRONT (FEET)	1970 BEACH WIDTH (FEET)	1970 DAILY BEACH CAPACITY (VISITS)	1980 BEACH WIDTH (FEET)	1980 DAILY BEACH CAPACITY (VISITS)	1990 BEACH WIDTH (FEET)	1990 DAILY BEACH CAPACITY (VISITS)	2000 BEACH WIDTH (FEET)	2000 DAILY BEACH CAPACITY (VISITS)	2010 BEACH WIDTH (FEET)	2010 DAILY BEACH CAPACITY (VISITS)	2020 BEACH WIDTH (FEET)	2020 DAILY BEACH CAPACITY (VISITS)
ACCESS	0	3	22	20	35	14	0	0	0	0	0	0	0	0	0	0
MARINE DRIVE	65	114	1430	25	40	20	0	0	0	0	0	0	0	0	0	0
NE 16TH ST	35	61	770	50	75	75	35	35	0	0	0	0	0	0	0	0
NE 13TH ST.	4	7	88	50	30	30	0	0	0	0	0	0	0	0	0	0
NE 10TH ST.	0	3	22	35	100	22	60	22	20	14	0	0	0	0	0	0
ACCESS	0	3	22	10	45	9	5	1	0	0	0	0	0	0	0	0
ACCESS	0	3	22	15	25	8	0	0	0	0	0	0	0	0	0	0
POMPANO CITY BEACH	323	565	7106	1590	45	1431	5	159	0	0	0	0	0	0	0	0
NE 2ND ST	15	26	330	50	73	73	33	33	0	0	0	0	0	0	0	0
CITY OF POMPANO BEACH	283	495	6226	508	130	1320	90	914	50	508	10	102	0	0	0	0
CITY OF POMPANO BEACH	282	494	6204	526	60	631	20	210	0	0	0	0	0	0	0	0
ATLANTIC BLVD.	19	33	418	75	10	15	0	0	0	0	0	0	0	0	0	0
SE 2ND ST	24	42	528	40	50	40	10	8	0	0	0	0	0	0	0	0
SE 4TH ST	7	12	154	40	30	24	0	0	0	0	0	0	0	0	0	0
SE 6TH ST	4	7	88	50	90	88	50	50	10	10	0	0	0	0	0	0
SE 8TH ST	6	11	132	50	85	85	45	45	5	5	0	0	0	0	0	0
SE 12TH ST	4	7	88	50	50	50	10	10	0	0	0	0	0	0	0	0
CITY OF POMPANO BEACH	0	3	22	10	0	0	0	0	0	0	0	0	0	0	0	0
ACCESS	0	3	22	20	40	16	0	0	0	0	0	0	0	0	0	0
ACCESS	0	3	22	20	50	20	10	4	0	0	0	0	0	0	0	0
TERRA MARE DRIVE	0	3	22	100	50	22	10	20	0	0	0	0	0	0	0	0
ACCESS	0	3	22	20	35	14	0	0	0	0	0	0	0	0	0	0
ACCESS	0	3	22	20	35	14	0	0	0	0	0	0	0	0	0	0
PINE AVE	0	3	22	25	0	0	0	0	0	0	0	0	0	0	0	0
WASHINGTON AVE.	22	39	484	55	5	6	0	0	0	0	0	0	0	0	0	0
EL PRADO	145	254	3190	50	10	10	0	0	0	0	0	0	0	0	0	0
ACCESS	0	3	22	50	10	10	0	0	0	0	0	0	0	0	0	0
COMMERCIAL BLVD.	382	669	8404	50	10	10	0	0	0	0	0	0	0	0	0	0
DATURA AVE.	29	51	638	50	30	30	0	0	0	0	0	0	0	0	0	0
HIBISCUS AVE.	21	37	462	50	25	25	0	0	0	0	0	0	0	0	0	0
PALM AVE.	5	9	110	50	15	15	0	0	0	0	0	0	0	0	0	0
TOTAL			37114			4125		1511		537		102		0		0

LONGTERM EROSION RATE = -4 FT/YR

TABLE C-10

BROWARD COUNTY, SEGMENT II
FT. LAUDERDALE (MODIFICATION TO THE FEDERAL PROJECT)
BEACH CAPACITY WITHOUT PROJECT

DESCRIPTION	PUBLIC PARKING SPACES	NOTIONAL PARKING	PARKING & NOTIONAL CAPACITY (VISITS)	PUBLIC SHORE FRONT (FEET)	2002* BEACH WIDTH (FEET)	2002 DAILY BEACH CAPACITY (VISITS)	2010 BEACH WIDTH (FEET)	2010 DAILY BEACH CAPACITY (VISITS)	2020 BEACH WIDTH (FEET)	2020 DAILY BEACH CAPACITY (VISITS)
FLAMINGO RD.	0	3	22	30	91	22	83	22	73	22
OAKLAND PARK BLVD.	0	3	22	40	66	22	58	22	48	22
NE 30TH ST.	0	3	22	50	56	22	48	22	38	22
VISTA PARK	15	27	338	150	96	288	88	264	78	234
ACCESS	0	3	22	15	111	22	103	22	93	22
COMMERCE ST (NE 27TH)	21	39	476	100	76	152	68	136	58	116
ACCESS	0	3	22	15	76	22	68	20	58	17
NE 25TH ST	0	3	22	50	66	22	58	22	48	22
NE23RD ST	0	3	22	50	81	22	73	22	63	22
NE 22ND ST	0	3	22	50	76	22	68	22	58	22
NE 21ST ST	25	44	550	50	66	66	58	58	48	48
FT. LAUDERDALE BEACH	1075	1881	23648	8330	76	12662	68	11329	58	9663
TOTAL			25188			13344		11961		10232

LONGTERM EROSION RATE = -1 FT/YR

* THE BEACH WIDTH IS DETERMINED BY SUBTRACTING 4 YEARS OF THE EROSION RATE FROM THE 1998 EXISTING SHORELINE.

TABLE C-11

BROWARD COUNTY, SEGMENT II
POMPANO BEACH/LBTS (FEDERAL PROJECT)
WITH A 100 FOOT SHORELINE EXTENSION

DESCRIPTION	PUBLIC PARKING SPACES	NOTIONAL PARKING	PARKING & NOTIONAL CAPACITY (VISITS)	PUBLIC SHORE FRONT (FEET)	BEACH* WIDTH (FEET) +100 FT	DAILY BEACH CAPACITY (VISITS)
ACCESS	0	3	22	20	135	22
MARINE DRIVE	65	114	1430	25	140	70
NE 16TH ST	35	61	770	50	175	175
NE 13TH ST.	4	7	88	50	130	88
NE 10TH ST.	0	3	22	35	200	22
ACCESS	0	3	22	10	145	22
ACCESS	0	3	22	15	125	22
POMPANO CITY BEACH	323	565	7106	1590	145	4611
NE 2ND ST	15	26	330	50	173	173
CITY OF POMPANO BEACH	283	495	6226	508	230	2335
CITY OF POMPANO BEACH	282	494	6204	526	160	1682
ATLANTIC BLVD.	19	33	418	75	110	165
SE 2ND ST	24	42	528	40	150	120
SE 4TH ST	7	12	154	40	130	104
SE 6TH ST	4	7	88	50	190	88
SE 8TH ST	6	11	132	50	185	132
SE 12TH ST	4	7	88	50	150	88
CITY OF POMPANO BEACH	0	3	22	10	100	20
ACCESS	0	3	22	20	140	22
ACCESS	0	3	22	20	150	22
TERRA MARE DRIVE	0	3	22	100	150	22
ACCESS	0	3	22	20	135	22
ACCESS	0	3	22	20	135	22
PINE AVE	0	3	22	25	100	22
WASHINGTON AVE.	22	39	484	55	105	116
EL PRADO	145	254	3190	50	110	110
ACCESS	0	3	22	50	110	22
COMMERCIAL BLVD.	382	669	8404	50	110	110
DATURA AVE.	29	51	638	50	130	130
HIBISCUS AVE.	21	37	462	50	125	125
PALM AVE.	5	9	110	50	115	110
TOTAL			37114			10793

LONGTERM EROSION RATE = 0 FT/YR

*THE BEACH WIDTH FOR THE DESIGN CONDITION IS DETERMINED FROM THE 1970 SHORELINE.

TABLE C-12

BROWARD COUNTY, SEGMENT II
FT. LAUDERDALE (MODIFICATION TO THE FEDERAL PROJECT)
WITH A 20 FOOT SHORELINE EXTENSION

DESCRIPTION	PUBLIC PUBLIC PARKING SPACES	NOTIONAL PARKING	PARKING & NOTIONAL CAPACITY (VISITS)	PUBLIC SHORE FRONT (FEET)	BEACH* WIDTH (FEET) +20 FT	DAILY BEACH CAPACITY (VISITS)
FLAMINGO RD.	0	3	22	30	115	22
OAKLAND PARK BLVD.	0	3	22	40	90	22
NE 30TH ST.	0	3	22	50	80	22
VISTA PARK	15	27	338	150	120	338
ACCESS	0	3	22	15	135	22
COMMERCE ST (NE 27TH)	21	39	476	100	100	200
ACCESS	0	3	22	15	100	22
NE 25TH ST	0	3	22	50	90	22
NE23RD ST	0	3	22	50	105	22
NE 22ND ST	0	3	22	50	100	22
NE 21ST ST	25	44	550	50	90	90
FT. LAUDERDALE BEACH	1075	1881	23648	8330	100	16660
		TOTAL	25188			17464

LONGTERM EROSION RATE = 0 FT/YR

*THE BEACH WIDTH FOR THE DESIGN CONDITION IS DETERMINED FROM THE ESTIMATED 2002 SHORELINI

C-72. Controlled aerial photographs were used to determine the amount of dry beach in the project area. The 1970 ECL/baseline was used to determine the beach width for the Federal project. For the modification to the Federal project, the 1998 shoreline was plotted on aerial photographs and the beach width was determined by subtracting three years of the erosion rate from the existing 1998 shoreline in order to estimate the beach width for 2002.

C-73. The daily beach capacity parking limitation was determined by adding the number of public parking spaces at each public access, the corresponding notional parking spaces, and multiplying this value by 8. The value of 8 is based on 4 people per car, with a daily turnover rate of 2.

C-74. The available public parking and beach accesses were determined using the data presented in the 1981 GDM for Segment II of Broward County and the 1987 Broward County Beach Management Plan (USACE, 1981 and CPE, 1987) . This data was verified and updated by analyzing the 1999 aerial photographs of the project area and conducting a field inspection.

C-75. Daily beach activity capacity may be limited by public access, parking, and "notional parking." Notional parking and notional visitors are terms commonly used to describe beach visitors such as walk-ons, cyclists, and drop-offs from either buses or cars that recreate on a beach but do not require actual parking spaces. Using the frequency distribution of daily beach activity presented in Figure C-2, a value can be estimated that represents the additional number of people that visit the beach (notional visits) over the number of people that visit the beach due to parking. The number of visits due to parking is estimated to be 11,900. The average number of visits in excess of the parking visits is 32,700. Dividing 32,700 by 11,900 results in a notional visitation value of 2.75. In order to determine the notional parking for each access, the capacity (visits) due to parking alone is first estimated for each access. Next, each parking capacity is multiplied by the notional visits factor of 2.75. This is the total capacity (visits) for each access. The total capacity is subtracted by the capacity due to parking which yields the capacity due to notional parking. Finally, the notional parking capacity is divided by a factor of eight (four people per car and a turnover rate of two) to yield the notional parking at each access.

Travel Cost Method

C-76. The demand for the project area has been developed such that it reflects the socio-economic characteristics and takes into account other available recreational resources within the project area and nearby recreational resources which may act as "sinks" which lessen the demand for the project. The recreation benefit evaluation procedure must determine a willingness to pay, or assign a value to the recreational usage generated by the proposed project. Engineering Regulation 1105-2-100 allows three acceptable methods for determining the value of a recreation visit: the travel cost method, contingent valuation method, and unit day value method. The travel cost method was used for this study.

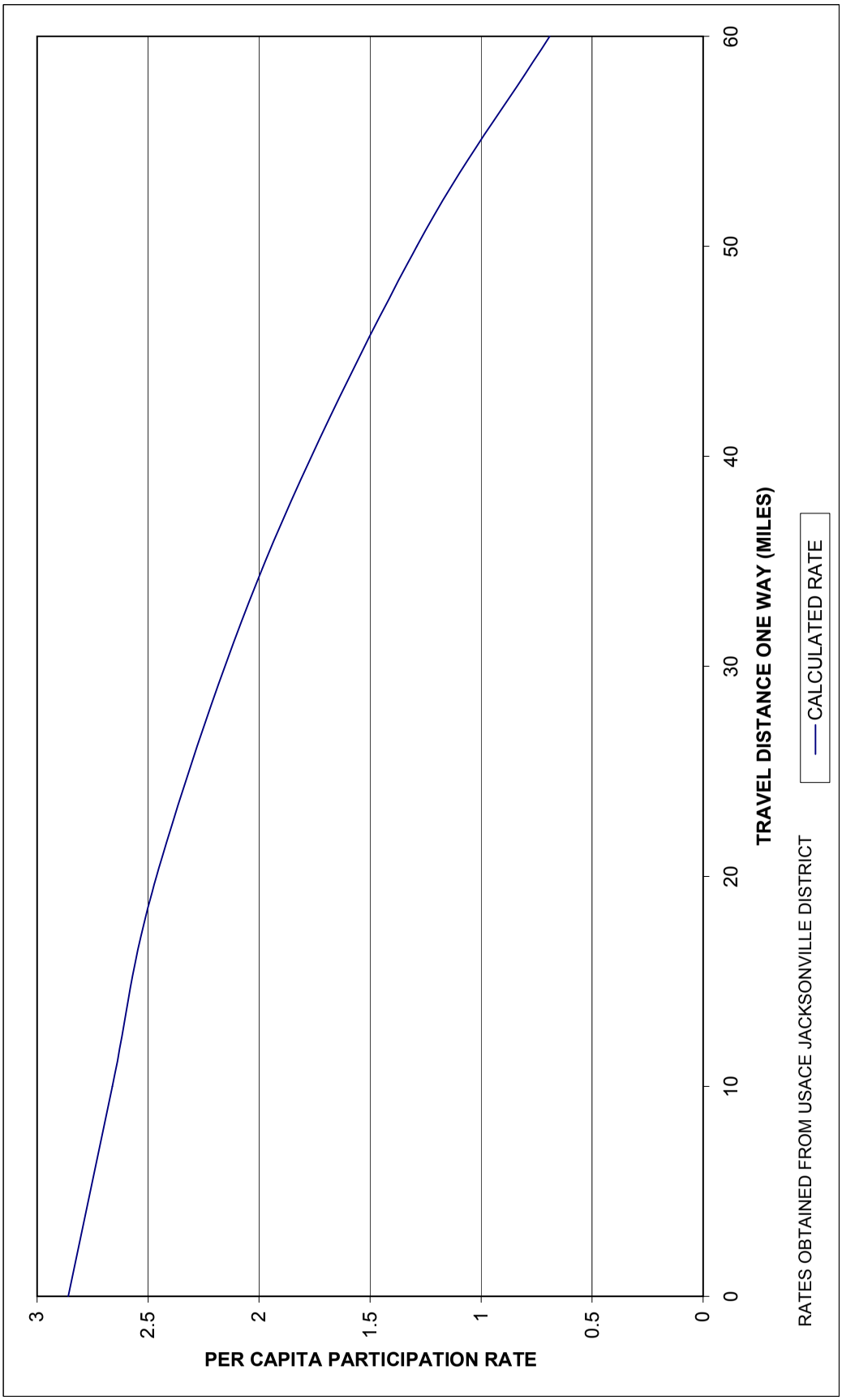
C-77. The basic premise of the travel cost method is that per capita participation to a recreational site decreases as out-of-pocket expenses and travel time to the site increases with other factors remaining constant. The travel cost method consists of deriving a demand curve by using the variable costs of travel and the value of time as proxies for price.

C-78. Estimating Use. The preferred method for estimating use is to relate recreational usage of the proposed site to distance traveled, socio-economic factors, site specific characteristics, and alternative recreation opportunities. The U.S. Army Corps of Engineers Jacksonville District performed a special analysis to determine the per capita participation by zip code for beach activity in Broward County. Using the zip code areas as population zones, a relationship can be developed between recreational beach usage and travel distance for Broward County. The population zones are also used later in the derivation of the resource demand curve.

C-79. The regression analysis used to define the relationship between the per capita participation and travel distance for beach activity was prepared by the U.S. Army Corps of Engineers Jacksonville District. Using this data, a relationship between the per capita participation rate and travel distance is shown in Figure C-3. This functional relationship is assumed to be valid throughout the economic life of the project. The acceptable range of this function is assumed to be from 0 to 60 miles, one way. Participation for distances greater than 60 miles is considered to be zero.

C-80. Deriving Demand. The travel cost method is based on correlating increases in travel distance to the site with increases in the cost of travel or price of recreation for the site. The amount of recreational visits to the project site for different incremental distances is determined by using the per capita participation relationship. This process is used to develop a recreational resource demand curve.

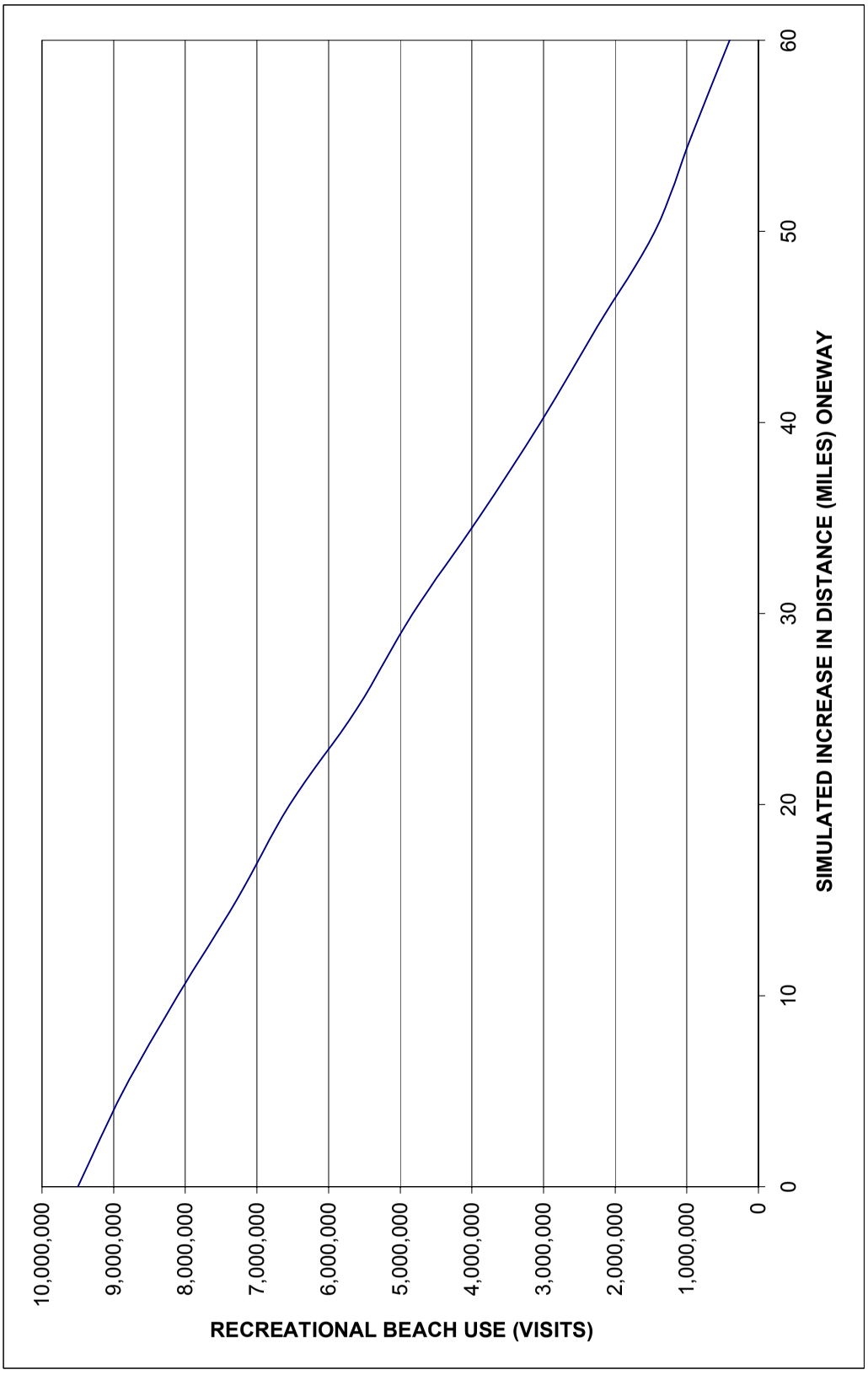
C-81. A resource demand relationship plot was constructed using the population zone data provided by the USACE. The distribution of the population between the zones is shown in Table C-13. The data for zones 3 and 4 were averaged in order to maintain a consistent decreasing participation rate between each consecutive zone. Based on the current distribution of population, recreational demand for the beach was determined by multiplying the population in each zone by the participation rate. This yields the quantity of recreational use, or visits, that would be demanded at a zero price and is the initial point on the resource demand plot. To define the remainder of the plot, other points are generated by making small incremental increases in travel distance and the associated increases in price of participation. This process is essentially equivalent to moving the project farther and farther from the potential users, requiring them to pay more and more in travel costs. As the simulated distance increases, use decreases for each increment in distance, and a new use estimate is computed using the per capita participation curve. For this study, 5 mile increments were used to define the points on the resource demand relationship as shown in Figure C-4.



BROWARD COUNTY, SEGMENT II

FIGURE C-3

PER CAPITA PARTICIPATION RATE VS. DISTANCE



BROWARD COUNTY, SEGMENT II FIGURE C-4

RESOURCE DEMAND RELATIONSHIP

Table C-13
Per Capita Participation Data

Zone	Population	One-Way Mile to Beach	Participation Rate	Total Demand (Visits)
1	1,606,011	10	2.66	4,273,661
2	1,286,462	20	2.46	3,167,090
Avg. 3 and 4 [(1)]	526,497	35	1.97	1,038,313
5	667,348	50	1.29	860,879
6	233,402	60	0.69	161,281
Total Demand				9,501,233

Note: Data provided by USACE Jacksonville District.

[(1)] Zones 3 and 4 were averaged in order to maintain a consistent decreasing participation rate between each zone.

C-82. Cost of Travel. The price associated with various quantities of use is determined by calculating the cost of travel associated with the incremental increases in distance. These are the costs that would be incurred by the recreation users if they were required to travel the additional mileage. The out-of-pocket travel costs are the price that potential users would be most aware of when making a decision about whether to visit a particular recreation area.

C-83. The cost of travel consists of out-of-pocket travel costs and the opportunity cost of time. Out-of-pocket travel costs are determined as an average variable cost per mile. Based on data published by the U.S. Department of Transportation (USDOT), the variable cost to operate a car in 1984 was computed to be 11.47 cents per mile (USDOT, 1985). No data on the cost of travel has been computed or published by the USDOT since 1985. However, the American Automobile Association (1998) prepares a pamphlet each year on the costs of owning and operating automobiles. Out-of-pocket travel (variable) costs to operate an automobile are summarized in Table C-14. For an average of 4 passengers per vehicle, the total variable cost is 2.68 cents per mile per person.

Table C-14
Cost to Operate An Automobile
(Cents Per Mile)

Vehicle Class	Variable Costs			
	Maintenance	Gasoline and Oil	Tires	Total Variable Cost
Full Size	3.2	7.4	1.4	12.0
Intermediate	3.1	6.3	1.4	10.8
Compact	2.9	5.0	1.3	9.2
Average				10.7

Source: American Automobile Association, 1998

C-84. The opportunity cost of time was determined using the guidance provided by IWR Report 91-R-12 (USACE, 1991). Based on the 1998 U.S. family income of $38,885, the opportunity cost of time is $11.21 per car/per hour. Based on the 1998 Florida Statistical Abstract, the 1997 median family income in Broward County is $31,264. Therefore, the opportunity cost of time is computed as shown below:

$$\frac{\$11.21 \times \$31,264}{\$38,885} = \$9.01$$

For an average of 4 people per car, this results in an opportunity cost of time of $2.25 per hour per visitor.

Cost Per Visit. The cost or value of a beach visit is computed in Table C-15. The incremental distances of the resource demand curve are converted into a cost per individual using a cost per mile factor that reflects both time and out-of-pocket travel costs. The value of the visit is a weighted average of the average demand times the increment in total cost (Table C-15). This value is equal to the average amount users are willing to pay, but do not have to pay, for the opportunity to participate in recreation within the project area. The average cost per visit is $3.91.

Benefit Analysis

C-85. Recreational benefits are realized when the number of beach visits that result from the construction of a shore protection project exceed the number of visits that occur without the project. The difference in visitation is the recreational benefit of the project. The value of the benefit is determined by multiplying the number of visits attributable to the project by the value of each visit. This analysis must be performed for each year or incremental years throughout the economic life of the project. The analysis was conducted for the current Federal project area (Pompano Beach/LBTS) and the modification to the Federal project area (Ft. Lauderdale) in Segment II. For the Federal project area, the economic life is a 50-year life beginning in 1970 (pre-construction conditions), in order to justify continued participation in the project. For the modification to the Federal project area the economic life is an 18-year life beginning in 2002 (time of next scheduled renourishment). The resulting benefits are then annualized to determine an annual equivalent recreational benefit.

C-86. The distribution of daily demand for the project area is used to determine the expected amount of visitation in each year. By applying the frequency distribution that was shown in Figure C-2 to the annual beach activity demand in Tables C-7, C-8, and C-9, the distribution of daily beach activity demand can be determined for the economic life of the project. This information is used along with the beach activity capacity data in Tables C-9 to C-12 to calculate the number of visits that are a direct result of the project.

C-87. The economic analysis of the recreational benefits for the current Federal project area and the modification to the Federal project area was conducted for NED plan widths. The individual analysis for the various beach width extensions in each reach are summarized in Sub-Appendix

TABLE C-15

VALUE OF AVERAGE VISIT TO THE BEACH

ONE WAY TRAVEL DISTANCE (MILES)	TWO WAY TRAVEL DISTANCE (MILES)	PARKING DISTANCE (MILES)	TOTAL TRAVEL DISTANCE (MILES)	TRAVEL TIME (HOURS)	TRAVEL COSTS ($/VISITS)	OPPORTUNITY COST OF TIME ($/VISITS)	TOTAL COST OF TRAVEL ($/VISIT)	BEACH USE DEMAND (VISITS)	AVG. DEMAND TIMES INCREMENTAL COST($)
0	0	1	1	0.00	$0.03	$0.00	0.03	9,501,223	$8,950,856
5	10	1	11	0.31	$0.29	$0.71	1.00	8,866,234	$5,179,717
10	20	1	21	0.47	$0.56	$1.05	1.61	8,106,507	$5,905,524
15	30	1	31	0.69	$0.83	$1.55	2.38	7,282,480	$2,728,801
20	40	1	41	0.75	$1.10	$1.68	2.77	6,542,189	$4,110,760
25	50	1	51	0.93	$1.36	$2.09	3.45	5,609,200	$1,527,129
30	60	1	61	0.94	$1.63	$2.11	3.74	4,826,469	$2,679,787
35	70	1	71	1.09	$1.90	$2.46	4.36	3,907,403	$2,131,953
40	80	1	81	1.25	$2.17	$2.80	4.97	3,040,987	$1,623,185
45	90	1	91	1.40	$2.43	$3.15	5.58	2,249,242	$1,133,745
50	100	1	101	1.55	$2.70	$3.50	6.20	1,445,823	$729,473
55	110	1	111	1.71	$2.97	$3.84	6.81	931,652	$409,048
60	120	1	121	1.86	$3.24	$4.19	7.43	401,503	$0
								TOTAL	$37,109,977
								VALUE OF AVERAGE VISIT	$3.91

UNIT OPPORTUNITY COST OF TIME: $2.25 /HR/VISITOR

UNIT TRAVEL COST: 2.68 CENTS/MILE/VISITOR

C-2. The analysis was performed using an interest rate of 6.125% and an average cost per visit of $3.91. For the NED plans, the recreational benefits are $8,933,000 for the Federal project area (100 foot shoreline extension) and $1,819,000 for the modification to the Federal project area (20 foot shoreline extension). Similar to the primary benefits, the total recreational benefits of the NED projects were combined in Table C-16. The total recreational benefit is $9,121,000.

BENEFIT SUMMARY

C-88. A summary of project benefits is provided in Table C-17. The benefit to cost ratio for the combined reevaluated and modified project is 8.3 to 1.

Table C-16

Combined Reevaluation and Modification of the Federal Project Pompano Beach/LBTS and Ft. Lauderdale Recreational Benefits

Project Year	Pompano Beach/ LBTS		Ft. Lauderdale	
	Recreational Benefit	Present Worth at Base Year	Recreational Benefit	Present Worth at Base Year
1	$3,110,406	$3,110,406		
2	$3,697,085	$3,483,708		
3	$4,283,764	$3,803,559		
4	$4,870,443	$4,074,885		
5	$5,457,123	$4,302,223		
6	$6,043,802	$4,489,745		
7	$6,630,481	$4,641,291		
8	$7,217,160	$4,760,389		
9	$7,803,839	$4,850,279		
10	$8,390,519	$4,913,936		
11	$8,977,198	$4,954,088		
12	$9,162,226	$4,764,379		
13	$9,347,254	$4,580,065		
14	$9,532,283	$4,401,156		
15	$9,717,311	$4,227,643		
16	$9,902,340	$4,059,497		
17	$10,087,368	$3,896,679		
18	$10,272,396	$3,739,132		
19	$10,457,425	$3,586,791		
20	$10,642,453	$3,439,580		
21	$10,827,481	$3,297,413		
22	$11,011,704	$3,159,968		
23	$11,195,926	$3,027,405		
24	$11,380,148	$2,899,618		
25	$11,564,371	$2,776,496		
26	$11,748,593	$2,657,928		
27	$11,932,815	$2,543,798		
28	$12,117,038	$2,433,988		
29	$12,301,260	$2,328,380		
30	$12,485,483	$2,226,855		
31	$12,669,705	$2,129,293		
32	$12,761,627	$2,020,958		
33	$12,853,549	$1,918,035	$700,210	$104,487
34	$12,945,470	$1,820,261	$846,453	$119,020
35	$13,037,392	$1,727,384	$992,696	$131,527
36	$13,129,314	$1,639,164	$1,138,939	$142,194
37	$13,221,236	$1,555,374	$1,285,181	$151,191
38	$13,313,158	$1,475,795	$1,431,424	$158,677
39	$13,405,080	$1,400,221	$1,577,667	$164,794
40	$13,497,001	$1,328,455	$1,723,910	$169,677
41	$13,588,923	$1,260,309	$1,870,153	$173,448
42	$13,639,872	$1,192,023	$2,016,802	$176,253
43	$13,690,821	$1,127,421	$2,163,452	$178,157
44	$13,741,769	$1,066,305	$2,310,101	$179,254
45	$13,792,718	$1,008,488	$2,456,751	$179,631
46	$13,843,666	$953,794	$2,603,401	$179,368
47	$13,894,615	$902,053	$2,750,050	$178,536
48	$13,945,564	$853,108	$2,896,700	$177,203
49	$13,996,512	$806,808	$3,043,349	$175,429
50	$14,047,461	$763,010	$3,189,999	$173,270
Total		$138,379,538		$2,912,118
Total Base Year Worth	$141,291,656			
Annualized Total Benefit	**$9,120,939**			
Interest Rate	6.125%			

TABLE C-17

Summary of Benefits

Project	Project Limits	Design Width (feet)	Nourishment Interval (yrs)	Annualized Costs (1)	Primary Benefits	Reference Table	Recreational Benefits (2)	Total Benefits	Net Benefits	Benefit to Cost Ratio
Reevaluation of Federal Project	R26 to R53	100	5	$3,984,000	$25,258,000	C-2	$8,933,000	$34,191,000	$30,207,000	8.6
Modification to the Federal Project (NED Ft. Lauderdale Project)	R53 to R71	20	6	$1,287,000	$2,663,000	C-4	$1,819,000	$4,482,000	$3,195,000	3.5
Reevaluated and Modified Federal Project	R26 to R71	100 / 20	5 / 6	$4,155,000	$25,533,000	C-6	$9,121,000	$34,654,000	$30,499,000	8.3

(1) Annualized costs can be referred to Table A-29.
(2) Recreation benefits are summarized in paragraph C-87.

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SUB-APPENDIX C-1

RISK & UNCERTAINTY STORM DAMAGE MODEL
INPUT DATA FILE

POMPANO BEACH/LAUDERDALE-BY-THE-SEA

STORM DAMAGE MODEL INPUT DATA FILE

```
'BROWARD [redacted] Low Rise I&S'
1970,50
 0.0
 4.0     8.0    12.0    16.0    20.0
24.0    28.0    32.0    36.0    40.0
44.0    48.0    52.0    56.0    60.0
64.0    68.0    72.0    76.0    80.0
84.0    88.0    92.0    96.0   100.0
104.0  108.0   112.0   116.0   120.0
124.0  128.0   132.0   136.0   140.0
144.0  148.0   152.0   156.0   160.0
164.0  168.0   172.0   176.0   180.0
184.0  188.0   192.0   196.0   200.0
8
.005,190
.01,161
.02,137
.05,95
.10,73
.20,55
.50,29
1.0,18
16
'CSP-SMALL (AFTER)          ',  625 ,  29    ,  1 ,1.00        1
'CSP MEDIUM (AFTER)         ',  750 ,  55    ,  1 ,1.00        2
'CSP-LARGE (AFTER)          ',  850 ,  73    ,  1 ,1.00        3
'DUMMY                      ',    0 ,   0    ,  1 ,1.00        4
'DUMMY                      ',    0 ,   0    ,  1 ,1.00        5
'DUMMY                      ',    0 ,   0    ,  1 ,1.00        6
'DUMMY                      ',    0 ,   0    ,  1 ,1.00        7
'DUMMY                      ',    0 ,   0    ,  1 ,1.00        8
'DUMMY                      ',    0 ,   0    ,  1 ,1.00        9
'AIA SIDEWALL               ',  100 ,   5    ,  0 ,1.00       10
'DUMMY                      ',    0 ,   0    ,  0 ,0.00       11
'DUMMY                      ',    0 ,   0    ,  0 ,0.00       12
'RUBBLE   [redacted]        ',  300 ,  65    ,  0 ,0.65       13
'DUMMY                      ',    0 ,   0    ,  1 ,1.00       14
'DO NOTHING                 ',    0 ,   0    ,  0 ,0.00       15
'DUMMY                      ',    0 ,   0    ,  1 ,1.00       16
1.33
'322  484329041350'    74484,    120,  2,    15, 1,    350, 410, 500,    'VN'     , -1, 1,    'R25',  0
'323  484329041360'   347448,    308,  2,    15, 1,    249, 279, 321,    'VC'     , -1, 0,    'R25',  0
'324  484329041370'   361056,     79,  2,    15, 1,    155, 192, 217,    'VC'     , -1, 0,    'R25',  0
'325  484329041380'   237996,     89,  2,    15, 1,    137, 185, 211,    'VC'     , -1, 0,    'R25',  0
'326  484329041350'   418080,     74,  2,     1, 1,    150, 161, 208,    'VC'     , -1, 0,    'R25',  0
'327  484329041340'   288312,     75,  2,     1, 1,    151, 175, 211,    'VC'     , -1, 0,    'R25',  0
'328  484329041190'        0,     20,  1,    15, 1    130, 131, 132,    'PC', -1, 0,          'R25',  0
'329  484329040830'   155200,    100,  2,     1, 1,    151, 350, 380,    'VN'     , -1, 1,    'R25',  0
'330  484329040860'   491664,    100,  2,     1, 1,    350, 360, 370,    'VN'     , -1, 1,    'R25',  0
'331  484329040850'   133668,    100,  1,     1, 1,    350, 409, 445,    'VN'     , -1, 1,    'R25',  0
'332  484329041330'    34920,     77,  1,     1, 1,    148, 218, 236,    'VC'     , -1, 0,    'R25',  0
'333  484329041180'   403332     101,  1,     3, 3,    159, 223, 249,    'VC'     , -1, 0,    'R25',  0
'334  484329041320'   387348,     87,  2,     3, 3,    181, 220, 298,    'VC'     , -1, 0,    'R25',  0
'335  484329041310'   505380,     92,  2,     3, 3,    206, 255, 284,    'VC'     , -1, 0,    'R25',  0
'336  484329040430'   103200,    100,  1,     3, 3,    200, 424, 461,    'VN'     , -1, 1,    'R25',  0
'337  484329040620'    92568,    100,  1,     3, 3,    205, 412, 442,    'VN'     , -1, 1,    'R25',  0
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'342  484329040440'   260472,    100,  2,     3, 3,    212, 443, 492,    'VN'     , -1, 1,    'R25',  0
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'341  484329040350'   166068,    100,  1,     3, 3,    219, 437, 459,    'VN'     , -1, 1,    'R26',  0
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'344  484329041270'        0     76,  2,    15, 3,    188, 237, 289,    'VC'     , -1, 0,    'R26',  0
'345  484329041260'    59772,    78,  2,    15, 3,    139, 189, 243,    'VC'     , -1, 0,    'R26',  0
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'346  484329041250',    643368,    81,  2,    15, 1,    140, 164, 250,    'VC'      , -1, 0,    'R26',  0
'347  484329041240',    480540,    75,  1,    1, 1,     145, 179, 211,    'VC'      , -1, 0,    'R26',  0
'348  484329041230',    161352,    71,  1,    1, 1,     174, 193, 224,    'VC'      , -1, 0,    'R26',  0
'349  484329041220',    162036,    140, 1,    1, 1,     195, 235, 258,    'VC'      , -1, 0,    'R26',  0
'351  484329041200',    6561000,   82,  4,    1, 1,     244, 310, 350,    'VC'      , -1, 0,    'R26',  0
'352  484329040280',    82008,     100, 2,    15, 1,    155, 370, 401,    'VN'      , -1, 1,    'R26',  0
'353  484329040130',    88620,     100, 1,    15, 1,    140, 382, 404,    'VN'      , -1, 1,    'R26',  0
'354  484329040120',    179184,    110, 2,    1, 1,     145, 400, 430,    'VN'      , -1, 1,    'R26',  0
'355  484329040030',    168552,    120, 2,    1, 1,     174, 430, 465,    'VN'      , -1, 1,    'R26',  0
'356  484329030060'     4920000,   100, 4,    1, 1,     290, 335, 375,    'VC'      , -1, 0,    'R26',  0
'357  484329BG',        9268968,   176, 5,    1, 1,     275, 336, 445,    'VC'      , -1, 0,    'R26',  0
'358  484329AD',        7286256,   395, 14,   1, 1,     275, 317, 375,    'VC'      , -1, 0,    'R27',  0
'359  484329030110'     171252,    50,  1,    1, 1,     65, 285, 320,     'VN'      , -1, 1,    'R27',  0
'360  484329AC',        7216764,   156, 14,   15, 1,    144, 157, 244,    'VC'      , -1, 0,    'R27',  0
'361  484329010060',    0,         100, 1,    15, 1,    115, 125, 130,    'VC'      , -1, 0,    'R27',  0
'362  484329010070',    885396,    100, 3,    1, 1,     126, 415, 472,    'VN'      , -1, 1,    'R27',  0
'363  484329BD',        6259140,   207, 3,    2, 1,     114, 146, 270,    'VC'      , -1, 0,    'R27',  0
'364  484329CC',        6456424,   102, 10,   1, 1,     126, 187, 363,    'VC'      , -1, 0,    'R27',  0
'365  484329BC',        3665928,   117, 7,    1, 1,     90, 106, 136,     'VC'      , -1, 0,    'R27',  0
'366  484329CB',        4948872,   170, 10,   15, 1,    75, 100, 210,     'VC'      , -1, 0,    'R28',  0
'367  484329BJ',        146796,    103, 3,    1, 1,     55, 81, 439,      'VC'      , -1, 0,    'R28',  0
'368  484330ND',        3972636,   204, 4,    1, 1,     134, 210, 278,    'VC'      , -1, 0,    'R28',  0
'369  484330019999'     2789000,   120, 7,    2, 2,     77, 118, 179,     'VC'      , -1, 0,    'R28',  0
'370  484330011400',    1460976,   162, 6,    1, 1,     92, 128, 200,     'VC'      , -1, 0,    'R28',  0
'371  484330011390',    0,         100, 1,    15, 1,    100, 300, 315,    'VC'      , -1, 0,    'R28',  0
'372  484330011160',    1619124,   155, 6,    1, 1,     120, 153, 225,    'VC'      , -1, 0,    'R29',  0
'373  484330AB',        23617680,  415, 16,   2, 2,     121, 148, 275,    'VC'      , -1, 0,    'R29',  0
'374  484330BA',        860856,    50,  2,    1, 1,     117, 140, 184,    'VN'      , -1, 1,    'R29',  0
'375  484331CD',        3663624,   328, 1,    1, 1,     134, 137, 289,    'VC'      , -1, 0,    'R29',  0
'376  484331BH',        779988,    103, 2,    1, 1,     135, 150, 234,    'VC'      , -1, 0,    'R29',  0
'377  484331100110',    198432,    80,  2,    1, 1,     415, 495, 535,    'VN'      , -1, 1,    'R29',  0
'378  484331100150',    72336,     90,  2,    1, 1,     415, 465, 510,    'VN'      , -1, 1,    'R29',  0
'379  484331100270'     371160,    80,  2,    1, 1,     405, 480, 540,    'VN'      , -1, 1,    'R29',  0
'380  484331DK',        6477300,   105, 7,    1, 1,     123, 147, 251,    'VC'      , -1, 0,    'R30',  0
'381  484331100280'     337956,    80,  2,    1, 1,     400, 475, 53,     'VN'      , -1, 1,    'R30',  0
'382  484331BA',        19374948,  375, 19,   1, 1,     119, 149, 234,    'VC'      , -1, 0,    'R30',  0
'383  484331099999'     51000,     102, 2,    1, 1,     118, 134, 217,    'VC'      , -1, 0,    'R30',  0
'384  484331BK',        2507196,   110, 8,    1, 1,     390, 480, 550,    'VN'      , -1, 1,    'R30',  0
'385  484331100110'     230364,    260, 2,    1, 1,     370, 470, 580,    'VN'      , -1, 1,    'R30',  0
'386  484331100090',    76956,     107, 3,    15, 1,    104, 115, 218,    'VC'      , -1, 0,    'R30',  0
'387  484331100100',    51612,     208, 12,   15, 1,    142, 177, 236,    'VC'      , -1, 0,    'R30',  0
'388  484331100120',    61992,     90,  1,    1, 1,     360, 410, 411,    'VN'      , -1, 1,    'R30',  0
'389  484331240020',    0,         90,  1,    1, 1,     350, 415, 416,    'VN'      , -1, 1,    'R30',  0
'391  484331090010',    160368,    54,  2,    1, 1,     151, 155, 224,    'VC'      , -1, 0,    'R30',  0
'393  484331090050',    0,         60,  1,    1, 1,     350, 410, 411,    'VN'      , -1, 1,    'R30',  0
'394  484331090220',    380364,    80,  1,    1, 1,     340, 620, 640,    'VN'      , -1, 1,    'R30',  0
'392  484331090020',    331536,    99,  1,    1, 1,     156, 160, 235,    'VC'      , -1, 0,    'R31',  0
'396  484331090030',    69060,     57,  1,    15, 1,    140, 155, 193,    'VC'      , -1, 0,    'R31',  0
'398  484331090060',    54024,     75,  2,    15, 1,    120, 490, 510,    'VN'      , -1, 1,    'R31',  0
'400  484331GA',        567744,    201, 2,    15, 1,    118, 131, 200,    'VC'      , -1, 0,    'R31',  0
'401  484331A0',        3221000,   200, 10,   15, 1,    118, 390, 500,    'VN'      , -1, 1,    'R31',  0
'402  484331DH',        998052,    105, 2,    1, 1,     102, 106, 170,    'VC'      , -1, 0,    'R31',  0
'403  484331116[illegible]',  296184,  200, 2,  1, 1,     100, 337, 385,    'VN'      , -1, 1,    'R31',  0
'405  484331100410',    218328,    102, 2,    1, 1,     97, 131, 159,     'VC'      , -1, 0,    'R31',  0
'406  ',                7481000,   150, 2,    1, 1,     245, 310, 450     'VN'      , -1, 1,    'R31',  0
'407  484331H3'         4114416,   202, 5,    2, 2,     79, 104, 145,     'VC'      , -1, 0,    'R31',  0
'408  484331GB'         7328244,   363, 5,    2, 2,     51, 80, 109,      'VC'      , -1, 0,    'R31',  0
'409  484331CG'         46795000,  410, 10,   1, 1,     160, 260, 400,    'VN'      , -1, 1,    'R31',  0
'410  484331080030'     148032,    82,  2,    1, 1,     32, 61, 92,       'VC'      , -1, 0,    'R31',  0
'411  484331080040'     33528,     50,  20,   1, 1,     150, 260, 280,    'VN'      , -1, 0,    'R31',  0
'412  484331080020',    0,         120, 1,    15, 1,    5, 6, 7,          'PC', -1, 0,          'R32',  0
'413  484331080090',    121392,    50,  2,    15, 1,    157, 227, 270,    'VN'      , -1, 1,    'R32',  0
'414  484331080330',    20556,     99,  1,    15, 1,    156, [illegible]9, 361,  'VC'      , -1, 0,    'R32',  0
'415  4331080010',      0,         50,  1     15, 1,    5,                'PC', -1, 0,          'R32',  0
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'419  484331BC',         36340776,  270,  18,   1, 1,      152, 513, 633,     'VN'      , -1, 1,     'R32',  0
'420  484331AM',         13868520,  270,  15,   1, 1,      160, 236, 342,     'VC'      , -1, 0,     'R33',  0
'421  484331AK',         14732328,  335,  15,   1, 1,      166, 228, 270,     'VC'      , -1, 0,     'R33',  0
'422  484331010190',     200000,    384,  2,    1, 1,      1, 47, 91,         'PN'      , -1, 1,     'R33',  0
'452  484331010210',     788232,    400,  2,    1, 1,      49, 241, 354,      'PC', -1, 0,           'R33',  0
'423  484331010320',     21360,     515,  1,    1, 1,      28, 111, 130,      'VC'      , -1, 0,     'R34',  0
'424  484331010300',     160000,    510,  1,    1, 1,      1, 92, 128,        'VC', -1, 0,           'R34',  0
'425  484331AH',         17427036,  151,  15,   1, 1,      205, 260, 393,     'VN'      , -1, 1,     'R34',  0
'426  484331BB',         32719788,  359,  19,   1, 1,      179, 267, 389,     'VN'      , -1, 1,     'R34',  0
'429  484331010360',     4327080,   252,  9,    1, 1,      205, 291, 318,     'VC'      , -1, 0,     'R34',  0
'431  494306060070',     0,         200,  1,    1, 1,      115, 116, 117,     'PC', -1, 0,           'R35',  0
'432  494306NR',         1912392,   155,  5,    1, 1,      48, 86, 145,       'VC'      , -1, 0,     'R35',  0
'433  494306060090',     0,         368,  3,    1, 1,      55, 96, 123,       'VC'      , -1, 0,     'R35',  0
'434  494306060460',     66000,     75,  1,     1, 1,      215, 270, 295,     'VN'      , -1, 1,     'R35',  0
'435  494306060590',     66000,     75,  1,     1, 1,      215, 310, 320,     'VN'      , -1, 1,     'R35',  0
'436  494306060580',     66000,     75,  1,     1, 1,      215, 330, 345,     'VN'      , -1, 1,     'R35',  0
'437  494306060570',     267312,    120,  1,    1, 1,      215, 270, 450,     'VN'      , -1, 1,     'R35',  0
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'439  494306060120',     0,         100,  1,    15, 15,    50, 51, 52,        'VC'      , -1, 0,     'R35',  0
'440  494306DD',         1204716,   97,  3,     13, 13,    63, 83, 123,       'VC'      , -1, 0,     'R35',  0
'441  494306060150',     174120,    64,  2,     1, 1,      70, 116, 154,      'VC'      , -1, 0,     'R35',  0
'442  494306060160',     91936,     45,  1,     1, 1,      72, 102, 149,      'VC'      , -1, 0,     'R35',  0
'444  494306060450',     441204,    250,  1,    1, 1,      69, 296, 425,      'VN'      , -1, 1,     'R35',  0
'445  494306060390',     38808,     50,  1,     1, 1,      72, 298, 335,      'VN'      , -1, 1,     'R35',  0
'446  494306060170',     218508,    100,  2,    1, 1,      81, 99, 155,       'VC'      , -1, 0,     'R35',  0
'447  494306060180',     0,         60,  1,     1, 1,      90, 91, 92,        'VC'      , -1, 0,     'R35',  0
'448  494306060400',     150408,    75,  1,     1, 1,      145, 307, 380,     'VN'      , -1, 1,     'R35',  0
'449  494306060410',     598572,    100,  2,    1, 1,      183, 318, 374,     'VN'      , -1, 1,     'R35',  0
'700  Cross Rd ',        40000,     40,  1,     1, 1,      120, 121, 321,     'PC', -1, 0,           'R27',  0
'701  Cross Rd ',        40000,     50,  1,     1, 1,      75, 76, 276,       'PC', -1, 0,           'R28',  0
'702  Cross Rd ',        40000,     30,  1,     1, 1,      120, 121, 321,     'PC', -1, 0,           'R29',  0
'703  Cross Rd ',        40000,     40,  1,     1, 1,      180, 230, 430,     'PC', -1, 0,           'R33',  0
'704  Cross Rd ',        40000,     40,  1,     1, 1,      185, 250, 450,     'PN', -1, 1,           'R33',  0
'705  Cross Rd ',        40000,     40,  1,     1, 1,      120, 270, 470,     'PN', -1, 1,           'R35',  0
'706  Cross Rd ',        40000,     20,  1,     15, 1,     40, 270, 470,      'PN', -1, 1,           'R35',  0
'  Road',                135000,    900,  1,    1, 1,      125, 260, 270,     'PN', -1, 1,           'R25',  0
'  Road',                90000,     600,  1,    1, 1,      210, 350, 360,     'PN', -1, 1,           'R26',  0
'  Road',                160000,    800,  1,    1, 1,      100, 250, 270,     'PN', -1, 1,           'R31',  0
'  Road',                200000,    1000,  1,   1, 1,      35, 170, 200,      'PN', -1, 1,           'R31',  0
'  Road',                100000,    500,  1,    15, 1,     150, 165, 190,     'PN', -1, 1,           'R32',  0
'  Road',                200000,    1000,  1,   15, 1,     160, 162, 190,     'PN', -1, 1,           'R33',  0
'  Road',                160000,    800,  1,    15, 1,     195, 197, 220,     'PN', -1, 1,           'R34',  0
'  Road',                260000,    1300,  1,   1, 1,      50, 215, 235,      'PN', -1, 1,           'R35',  0
'1  494306060190',       76896,     67,  2,     1, 1,      90, 144, 228,      'VC'      , -1, 0,     'R36',  0
'2  494306060200',       48060,     51,  2,     1, 1,      90, 147, 176,      'VC'      , -1, 0,     'R36',  0
'3  494306060210',       50556,     43,  1,     1, 1,      90, 115, 165,      'VC'      , -1, 0,     'R36',  0
'4  494306060220',       311544,    59,  1,     1, 1,      90, 106, 142,      'VC'      , -1, 0,     'R36',  0
'5  494306060290',       101832,    94,  1,     1, 1,      90, 106, 178,      'VC'      , -1, 0,     'R36',  0
'6  494306DJ',           1544532,   159,  2,    1, 1,      120, 176, 185,     'VC'      , -1, 0,     'R36',  0
'7  494306DB',           980472,    153,  1,    1, 1,      89, 108, 170,      'VC'      , -1, 0,     'R36',  0
'8  494306030040',       125760,    50,  1,     1, 1,      74, 100, 165,      'VC'      , -1, 0,     'R36',  0
'9  494306CM',           311772,    55,  1,     1, 1,      90, 120, 161,      'VC'      , -1, 0,     'R36',  0
'10  494306030040',      135948,    51,  2,     1, 1,      95, 124, 164,      'VC'      , -1, 0,     'R36',  0
'453  494306AB',         9227532,   200,  7,    1, 1,      185, 302, 420,     'VN'      , -1, 1,     'R36',  0
'455  494306GB',         3534060,   190,  2,    1, 1,      131, 291, 365,     'VN'      , -1, 1,     'R36',  0
'456  494306060320',     50052,     55,  1,     1, 1,      295, 400, 410,     'VN'      , -1, 1,     'R36',  0
'457  494306060330',     83688,     50,  1,     1, 1,      211, 307, 359,     'VN'      , -1, 1,     'R36',  0
'458  494306030300',     200900,    60,  1,     1, 1,      181, 291, 350,     'VN'      , -1, 1,     'R36',  0
'459  494306030220',     526020,    100,  3,    1, 1,      88, 297, 428,      'VN'      , -1, 1,     'R36',  0
'460  494306GM',         1837476,   150,  2,    1, 1,      126, 288, 405,     'VN'      , -1, 1,     'R36',  0
 11  494306030050',      257544,    59,  1      1, 1,      80, 95, 114,       'VC'      , -1, 0,     'R37',  0
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'12  494306010[illegible]',   168240,   53,  1,   1, 1,   78,  96, 141,   'VC'   , -1, 0,   'R37',  0
'13  494306GC',              7313712,  190, 13,   1, 1,   74, 106, 225,   'VC'   , -1, 0,   'R37',  0
'14  494306CD',              26342748, 197, 18,   2, 2,   77, 180, 326,   'VC'   , -1, 0,   'R37',  0
'15  494306DH',              35739672, 180, 18,   2, 2,   75, 100, 300,   'VC'   , -1, 0,   'R37',  0
'16  494306PY',              6691572,  335,  1,   1, 1,   80, 110, 135,   'VC'   , -1, 0,   'R37',  0
'461  4943060301[illegible]', 52800,   50,  1,   1, 1,  107, 289, 340,   'VN'   , -1, 1,   'R37',  0
'463  494306030130',         52884,    50,  1,   1, 1,   74, 274, 382,   'VN'   , -1, 1,   'R37',  0
'464  494306030140',         105660,   50,  1,   1, 1,   76, 292, 312,   'VN'   , -1, 1,   'R37',  0
'17  494306010080',          6148000,  220,  8,   1, 1,   91,  95, 357,   'VC'   , -1, 0,   'R38',  0
'18  494306AA',              2459100,   78,  6,   1, 1,   86, 142, 245,   'VC'   , -1, 0,   'R38',  0
'19  494305000020',          1426944,  156,  8,   1, 1,   88,  94, 160,   'VC'   , -1, 0,   'R38',  0
'20  494305000030',          468240,   153,  1,   1, 1,   75,  87, 217,   'VC'   , -1, 0,   'R38',  0
'21  494306GA',              14176956, 181, 11,  15, 1,   72,  89, 250,   'VC'   , -1, 0,   'R38',  0
'22  494305AB',              34490904, 300, 20,   2, 2,   45,  60, 175,   'VC'   , -1, 0,   'R39',  0
'23  4943050800[illegible]',  2157432,  204,  3,   1, 1,   50,  58, 148,   'VC'   , -1, 0,   'R39',  0
'24  494305AC',              30710292, 283, 29,   2, 2,   47,  61, 187,   'VC'   , -1, 0,   'R39',  0
'25  494306000320',          2064384,  251,  4,  13, 13,  51, 163, 185,   'VC'   , -1, 0,   'R40',  0
'26  494306AP',              18294372, 295, 16,   1, 1,   60,  81, 187,   'VC'   , -1, 0,   'R40',  0
'27  494306PT',              2070348,  160,  2,   1, 1,   54,  79, 234,   'VC'   , -1, 0,   'R40',  0
'28  494306PO',              1614336,  151,  3,   1, 1,   65, 101, 280,   'VC'   , -1, 0,   'R41',  0
'29  494306PV',              1444644,  198,  3,   2, 2,   79, 102, 205,   'VC'   , -1, 0,   'R41',  0
'30  494306PW',              1672380,  207,  3,   2, 2,   68,  87, 260,   'VC'   , -1, 0,   'R41',  0
'31  494306000380',          439656,   105,  2,   1, 1,   49, 107, 259,   'VC'   , -1, 0,   'R41',  0
'32  494306PX',              17955204, 310,  3,   1, 1,   84, 109, 284,   'VC'   , -1, 0,   'R41',  0
'33  494306HD',              26266284, 180, 25,   1, 1,   40,  80, 240,   'VC'   , -1, 0,   'R41',  0
'34  494306000410',          1743564,  199,  3,  13, 13,  39,  77, 184,   'VC'   , -1, 0,   'R42',  0
'35  494306HP',              3249168,  197,  4,   1, 1,   29,  65, 250,   'VC'   , -1, 0,   'R42',  0
'36  494306CA',              2665716,  102,  4,   1, 1,   30,  37, 195,   'VC'   , -1, 0,   'R42',  0
'37  494307AG',              12180908, 185, 16,   1, 1,   42,  74, 240,   'VC'   , -1, 0,   'R42',  0
'38  494307HN',              4304724,  209,  3,   1, 1,   21,  41, 258,   'VC'   , -1, 0,   'R42',  0
'39  4943070056[illegible]',  3216852,  197,  3,   1, 1,   10,  24, 165,   'VC'   , -1, 0,   'R42',  0
'40  494307AK',              22663680, 306, 16,   3, 3,   73,  85, 221,   'VC'   , -1, 0,   'R43',  0
'42  494307AC',              5816268,  157,  5,  15, 1,   13,  79, 300,   'VC'   , -1, 0,   'R43',  0
'43  494307HG',              5149428,  107,  7,  15, 1,   18,  58, 154,   'VC'   , -1, 0,   'R43',  0
'44  494307HK',              37645800, 343, 16,   1, 1,   47,  91, 280,   'VC'   , -1, 0,   'R44',  0
'45  494307HP',              9497352,  204,  9,   1, 1,   10,  28, 263,   'VC'   , -1, 0,   'R44',  0
'46  494307HP',              9497352,  250,  9,   1, 1,   20, 110, 250,   'VC'   , -1, 0,   'R44',  0
'47  4943070001[illegible]',  11283048, 149, 15,  15, 1,   32,  64, 217,   'VC'   , -1, 0,   'R44',  0
'48  494307AU',              21330748, 300, 16,   1, 1,   35, 124, 257,   'VC'   , -1, 0,   'R44',  0
'50  494307000320',          815880,   413,  2,  15, 1,   73, 145, 191,   'VC'   , -1, 0,   'R45',  0
'51  494307AF',              11879604, 192, 15,   1, 1,   60,  83, 247,   'VC'   , -1, 0,   'R45',  0
'52  494307AA',              10781508, 315,  2,  15, 1,   24,  39, 272,   'VC'   , -1, 0,   'R45',  0
'53  494307AB',              11228316, 299,  2,  15, 1,   17,  31, 285,   'VC'   , -1, 0,   'R46',  0
'54  49430710',              3985000,  220,  1,   1, 1,   13,  53, 200,   'VC'   , -1, 0,   'R46',  0
'55  494307AL',              26476692, 252, 15,   1, 1,   48,  71, 350,   'VC'   , -1, 0,   'R46',  0
'56  494307BH',              54887004, 474, 16,   2, 2,   31,  51, 170,   'VC'   , -1, 0,   'R47',  0
'57  494307BJ',              35998140, 318, 15,   2, 2,   30,  59, 180,   'VC'   , -1, 0,   'R47',  0
'58  494307CA',              58604136, 477, 16,   2, 2,   24,  50, 165,   'VC'   , -1, 0,   'R47',  0
'59  49431801061[illegible]', 1000956,  250,  5,   1, 1,   12,  20,  85,   'VC'   , -1, 0,   'R48',  0
'61  4943180105[illegible]',  118476,   51,  2,   1, 1,   16,  40,  86,   'VC'   , -1, 0,   'R48',  0
'62  494318BA',              2163156,  101,  6,   1, 1,   17,  54,  84,   'VC'   , -1, 0,   'R48',  0
'63  4943180105[illegible]',  167628,   99,  2,   1, 1,   17,  25,  79,   'VC'   , -1, 0,   'R48',  0
'64  4943180105[illegible]',  700464,  153,  2,   1, 1,   23,  28,  80,   'VC'   , -1, 0,   'R48',  0
'65  4943180105[illegible]',  143760,   70,  2,   1, 1,   28,  31,  90,   'VC'   , -1, 0,   'R48',  0
'66  4943180105[illegible]',  318756,   85,  3,   1, 1,   19,  21,  87,   'VC'   , -1, 0,   'R48',  0
'67  4943180B',              812028,   52,  2,  15, 1,   11,  30,  80,   'VC'   , -1, 0,   'R48',  0
'68  4943180105[illegible]',  220272,  106,  2,  15, 1,   28,  31,  79,   'VC'   , -1, 0,   'R48',  0
'69  4943180105[illegible]',  486684,   66,  2,   1, 1,   47,  50,  99,   'VC'   , -1, 0,   'R48',  0
'466  49431801061[illegible]', 1000956, 400,  3,   1, 1,   12, 270, 360,   'VN'   , -1, 1,   'R48',  0
'467  494318CM',              952164,   200,  2,   1, 1,   16, 260, 309,   'VN'   , -1, 1,   'R48',  0
'468  4943180106[illegible]',  449808,   200,  2,   1, 1,   16, 360, 400,   'VN'   , -1, 1,   'R48',  0
'469  4943180106[illegible]',  310596,   100,  2,   1, 1,   26, 262, 350,   'VN'   , -1, 1,   'R48',  0
'472  '943180108[illegible]',  139272,   50,  2,   1, 1,   10, [illegible] 300,   'VN'   , -1, 1,   'R48',  0
'473    '3180108[illegible]',  241764,   100,  2,  15, 1,   2, [illegible] 359,   'VN'   , -1, 1,   'R48',  0
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'474  4943180110630',    77292,    50,  2,    1, 1,    10, 320, 400,    'VN'     , -1, 1,    'R48',  0
'475  4943180110620',    61284,    50,  1,    1, 1,    33, 362, 407,    'VN'     , -1, 1,    'R48',  0
'476  4943180110930',    79068,    50,  2,   15, 1,    37, 267, 297,    'VN'     , -1, 1,    'R48',  0
'477  4943180110940',   165432,    50,  2,   15, 1,    35, 360, 400,    'VN'     , -1, 1,    'R48',  0
'478  4943180110920',   238560,   100,  1,   15, 1,    31, 262, 310,    'VN'     , -1, 1,    'R48',  0
'479  494318CK',        301620,    50,  2,   15, 1,    50, 360, 400,    'VN'     , -1, 1,    'R48',  0
'480  4943180110900',   232536,   100,  2,    1, 1,    30, 247, 298,    'VN'     , -1, 1,    'R48',  0
'481  4943180110960',    74328,    50,  2,    1, 1,    30, 360, 400,    'VN'     , -1, 1,    'R48',  0
'482  4943180110970',    92232,    50,  1,    1, 1,    30, 360, 400,    'VN'     , -1, 1,    'R48',  0
'70   4943180110490',   503916,    76,  3,    1, 1,    55, 70, 100,     'VC'     , -1, 0,    'R49',  0
'71   4943180110470',   130944,   103,  1,    1, 1,    56, 84, 114,     'VC'     , -1, 0,    'R49',  0
'72   494319DK',        1580580,  250,  3,    1, 1,    46, 58, 117,     'VC'     , -1, 0,    'R49',  0
'74   4943180119999',   0,        150,  1,    1, 1,    35, 65, 170,     'PC', -1, 0,         'R49',  0
'75   4943180110380',   831156,    49,  4,    1, 1,    42, 79, 126,     'VC'     , -1, 0,    'R49',  0
'76   4943180110370',   867288,    99,  2,    1, 1,    37, 38, 118,     'VC'     , -1, 0,    'R49',  0
'77   4943180110360',   437112,   103,  2,    1, 1,    41, 50, 111,     'VC'     , -1, 0,    'R49',  0
'78   4943180110350',   187080,    53,  2,    1, 1,    43, 51, 118,     'VC'     , -1, 0,    'R49',  0
'483  494318AF',        6070248,  200,  6,    1, 1,    56, 274, 373,    'VN'     , -1, 1,    'R49',  0
'484  4943180110860',   221952,   150,  2,    1, 1,    60, 280, 320,    'VN'     , -1, 1,    'R49',  0
'485  494318DB',        473304,   200,  2,    1, 1,    54, 285, 325,    'VN'     , -1, 1,    'R49',  0
'486  4943180110420',   214740,   100,  2,    1, 1,    55, 370, 400,    'VN'     , -1, 1,    'R49',  0
'487  4943180110840',   983688,   200,  1,   15, 1,    13, 286, 320,    'VN'     , -1, 1,    'R49',  0
'488  4943180111100',   0,        150,  1,    1, 1,    35, 275, 370,    'PN', -1, 1,         'R49',  0
'489  4943180111080',   973704,   100,  2,    1, 1,    35, 305, 380,    'VN'     , -1, 1,    'R49',  0
'490  4943180111130',   242076,   100,  2,    1, 1,    40, 310, 355,    'VN'     , -1, 1,    'R49',  0
'560  4943180110390',   9012,      67,  1,    1, 1,    30, 45, 90,      'VC'     , -1, 0,    'R49',  0
'561  4943180110400',   11100,     67,  1,    1, 1,    30, 45, 90,      'VC'     , -1, 0,    'R49',  0
'562  4943180110410',   2460,      67,  1,    1, 1,    30, 45, 90,      'VC'     , -1, 0,    'R49',  0
'79   4943180110340',   106680,    48,  2,    1, 1,    37, 69, 108,     'VC'     , -1, 0,    'R50',  0
'80   4943180110330',   308676,   103,  2,    1, 1,    18, 50, 128,     'VC'     , -1, 0,    'R50',  0
'81   494318GA',        3935640,   55,  2,    1, 1,    15, 300, 370,    'VC'     , -1, 0,    'R50',  0
'82   4943180110310',   41712,     48,  1,    1, 1,    65, 103, 143,    'VC'     , -1, 0,    'R50',  0
'83   4943180110300',   252504,   100,  2,    1, 1,    16, 75, 129,     'VC'     , -1, 0,    'R50',  0
'84   4943180110290',   253716,   118,  2,    1, 1,    23, 26, 64,      'VC'     , -1, 0,    'R50',  0
'85   4943180110280',   226824,   100,  1,    1, 1,    27, 168, 193,    'VN'     , -1, 1,    'R50',  0
'86   4943180110240',   276600,   100,  2,    1, 1,    -4, 146, 186,    'VN'     , -1, 1,    'R50',  0
'87   4943180110230',   985452,    97,  3,    1, 1,    24, 35, 120,     'VC'     , -1, 0,    'R50',  0
'494  4943180111160',   414336,   100,  1,    1, 1,    10, 320, 350,    'VN'     , -1, 1,    'R50',  0
'496  4943180111190',   167952,   120,  1,    1, 1,    30, 310, 400,    'VN'     , -1, 1,    'R50',  0
'498  4943180111230',   186324,   140,  1,    1, 1,    30, 320, 370,    'VN'     , -1, 1,    'R50',  0
'499  4943180111370',   86124,     50,  1,    1, 1,    25, 310, 360,    'VN'     , -1, 1,    'R50',  0
'501  4943180111380',   226476,    50,  2,    1, 1,    25, 330, 370,    'VN'     , -1, 1,    'R50',  0
'503  4943180111390',   325740,    50,  2,    1, 1,    30, 335, 360,    'VN'     , -1, 1,    'R50',  0
'506  4943180111400',   197796,    50,  2,    1, 1,    25, 330, 370,    'VN'     , -1, 1,    'R50',  0
'542  4913180110270',   133560,   100,  2,    1, 1,    20, 30, 100,     'PC', -1, 0,         'R50',  0
'88   4943180110220',   1192956,  203,  2,   15, 1,    24, 40, 128,     'VC'     , -1, 0,    'R51',  0
'89   4943180110200',   899520,    98,  5,    2, 2,    12, 29, 58,      'VC'     , -1, 0,    'R51',  0
'90   4943180110190',   250452,    56,  2,    2, 2,    60, 92, 126,     'VC'     , -1, 0,    'R51',  0
'91   4943180110180',   202452,    42,  2,    2, 2,    35, 58, 113,     'VC'     , -1, 0,    'R51',  0
'92   494318HP',        1764120,  102,  5,    2, 2,    36, 47, 124,     'VC'     , -1, 0,    'R51',  0
'93   494318DA',        3041880,  156,  2,   15, 1,    35, 35, 109,     'VC'     , -1, 0,    'R51',  0
'95   494318DD',        10493496,  96,  6,   15, 1,    34, 37, 113,     'VC'     , -1, 0,    'R51',  0
'96   494318CH',        4381708,  296,  3,    2, 2,    37, 114, 141,    'VC'     , -1, 0,    'R51',  0
'97   4943180119999',   472000,    52,  1,    2, 2,    22, 33, 89,      'VC'     , -1, 0,    'R51',  0
'508  4943180111410',   179884,   100,  1,   15, 1,    30, 320, 380,    'VN'     , -1, 1,    'R51',  0
'512  4943180111420',   57288,     50,  1,    2, 2,    30, 325, 360,    'VN'     , -1, 1,    'R51',  0
'514  4943180111430',   490632,    50,  1,    2, 2,    25, 320, 360,    'VN'     , -1, 1,    'R51',  0
'516  4943180111440',   99420,     50,  1,    2, 2,    30, 320, 360,    'VN'     , -1, 1,    'R51',  0
'518  4943180111450',   81576,     50,  1,    2, 2,    25, 320, 350,    'VN'     , -1, 1,    'R51',  0
'519  4943180111460',   230004,   100,  1,    2, 2,    30, 315, 360,    'VN'     , -1, 1,    'R51',  0
'523  4943180111560',   196116,    50,  1,   15, 1,    27, 310, 330,    'VN'     , -1, 1,    'R51',  0
'534  4943180111570',   158088,    50,  1,   15, 1,    25, 315, 360,    'VN'     , -1, 1,    'R51',  0
'525  494318AM',        1980768,  150,  1,   15, 1,    25, 300, 350,    'VN'     , -1, 1,    'R51',  0
'527  4943180111600',   933024,   100,  1,    2, 2,    30, 315, 328,    'VN'     , -1, 1,    'R51',  0
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'528  494318011620',     90804,     50,  2,     2, 2,     31, 288, 332,     'VN'      , -1, 1,    'R51',  0
'529  494318011630',     106056,    100,  2,    2, 2,     37, 289, 335,     'VN'      , -1, 1,    'R51',  0
'532  494318011640',     144672,    100,  2,    2, 2,     30, 284, 333,     'VN'      , -1, 1,    'R51',  0
'534  494318011641'      280404,    50,  2,     2, 2,     53, 285, 326,     'VN'      , -1, 1,    'R51',  0
'98  494318010070',      329904,    49,  3,     2, 2,     3, 9, 80,         'VC'      , -1, 0,    'R52',  0
'99  494318010060',      481812,    148,  5,    2, 2,     19, 46, 67,       'VC'      , -1, 0,    'R52',  0
'100  494318010050',     123132,    52,  2,     2, 2,     24, 50, 91,       'VC'      , -1, 0,    'R52',  0
'101  494318010040',     3720,      40,  1,     2, 2,     25, 30, 90,       'VC'      , -1, 0,    'R52',  0
'102  494318010030'      705384,    196,  2,    2, 2,     21, 82, 102,      'VC'      , -1, 0,    'R52',  0
'103  494318010020'      338220,    103,  2,    2, 2,     29, 46, 93,       'VC'      , -1, 0,    'R52',  0
'104  494318NN',         8555052,   201,  17,   1, 1,     52, 94, 210,      'VC'      , -1, 0,    'R52',  0
'537  494318DM',         2131704,   100,  3,    2, 2,     43, 277, 360,     'VN'      , -1, 1,    'R52',  0
'538  494318011750',     84552,     50,  2,     2, 2,     26, 275, 315,     'VN'      , -1, 1,    'R52',  0
'540  494318011710',     289092,    50,  2,     2, 2,     50, 307, 381,     'VN'      , -1, 1,    'R52',  0
'541  494318011650',     4553016,   375,  5,    2, 2,     32, 268, 352,     'VN'      , -1, 1,    'R52',  0
'105  494318AB',         20499324,  339,  17,   1, 1,     15, 30, 140,      'VC'      , -1, 0,    'R53',  0
'707  Cross St.',        40000,     50,  1,     15, 1,    80, 290, 490,     'PC', -1, 0,          'R36',  0
'708  Cross St.',        40000,     30,  1,     15, 1,    90, 250, 450,     'PC', -1, 0,          'R36',  0
'709  Cross St.',        40000,     30,  1,     1, 1,     130, 11, 211,     'PC', -1, 0,          'R37',  0
'710  Cross St.',        40000,     50,  1,     1, 1,     10, 6, 206,       'PC', -1, 0,          'R48',  0
'711  Cross St.',        75000,     100,  1,    15, 1,    5, 36, 236,       'PC', -1, 0,          'R50',  0
'712  Cross St.',        40000,     30,  1,     1, 1,     35, 51, 251,      'PC', -1, 0,          'R51',  0
'713  Cross St.',        40000,     60,  1,     1, 1,     50, 11, 211,      'PC', -1, 0,          'R52',  0
'714  Cross St.',        40000,     40,  1,     15, 1,    10, 310, 510,     'PC', -1, 0,          'R52',  0
'  Road',                230000,    1150,  1,   1, 1,     85, 245, 265,     'PN', -1, 1,          'R36',  0
'  Road',                656250,    1750,  1,   1, 1,     10, 165, 220,     'PN', -1, 1,          'R48',  0
'  Road',                337500,    900,  1,    1, 1,     15, 210, 255,     'PN', -1, 1,          'R49',  0
'  Road',                281250,    750,  1,    1, 1,     25, 225, 265,     'PN', -1, 1,          'R50',  0
'  Road',                243750,    650,  1,    1, 1,     20, 195, 240,     'PN', -1, 1,          'R51',  0
'  Road',                243750,    650,  1,    1, 1,     10, 160, 210,     'PN', -1, 1           'R52',  0
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FORT LAUDERDALE

STORM DAMAGE MODEL INPUT DATA FILES

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'BROWARD COUNTY, Reach 3'
2002,18
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 4.0    5.0    6.0    7.0    8.0    9.0
10.0   11.0   12.0   13.0   14.0   15.0
16.0   17.0   18.0   19.0   20.0   21.0
8
.005,163
.01,145
.02,122
.05,85
.10,45
.20,31
.50,19
1.0,18
16
'CSP-SMALL CAPPED          ', 625 ,  19 ,   1 ,1.00        1
'CSP-MEDIUM CAPPED         ', 750 ,  31 ,   1 ,1.00        2
'CSP-LARGE CAPPED          ', 850 ,  45 ,   1 ,1.00        3
'DUMMY                     ',   0 ,   0 ,   1 ,1.00        4
'DUMMY                     ',   0 ,   0 ,   1 ,1.00        5
'DUMMY                     ',   0 ,   0 ,   1 ,1.00        6
'DUMMY                     ',   0 ,   0 ,   1 ,1.00        7
'DUMMY                     ',   0 ,   0 ,   1 ,1.00        8
'DUMMY                     ',   0 ,   0 ,   1 ,1.00        9
'AIA SIDEWALK              ', 100 ,   5 ,   0 ,1.00       10
'DUMMY                     ',   0 ,   0 ,   0 ,0.00       11
'DUMMY                     ',   0 ,   0 ,   0 ,0.00       12
'RUBBLE - SMALL            ', 200 ,  31 ,   0 ,0.65       13
'DUMMY                     ',   0 ,   0 ,   1 ,1.00       14
'DO NOTHING                ',   0 ,   0 ,   0 ,0.00       15
'DUMMY                     ',   0 ,   0 ,   1 ,1.00       16
1.33
'106  494319AE',        43136508,    435,  21,    2, 2,       83, 110, 259,       'VC'     , -1, 0,    'R53',  0
'107  494319AM',        61764960,    331,  30,    3, 3,       68, 91, 276,        'VC'     , -1, 0,    'R53',  0
'108  494319CA',        22451604,    205,  16,    3, 3,       60, 122, 287,       'VC'     , -1, 0,    'R54',  0
'109  494319080030',    471456,      206,  3,     2, 2,       54, 77, 200,        'VC'     , -1, 0,    'R54',  0
'110  494319AD',        32895804,    186,  18,    3, 3,       54, 80, 247,        'VC'     , -1, 0,    'R54',  0
'111  494319080010',    5906100,     216,  9,     2, 2,       69, 124, 190,       'VC'     , -1, 0,    'R54',  0
'112  494319CH',        3897768,     208,  12,    2, 2,       77, 94, 175,        'VC'     , -1, 0,    'R54',  0
'113  494319BB',        29856228,    195,  19,    3, 3,       97, 165, 294,       'VC'     , -1, 0,    'R55',  0
'114  494319AA',        26688132,    215,  17,    2, 2,       100, 129, 279       'VC'     , -1, 0,    'R55',  0
'115  494319BM',        60196944,    410,  30,    3, 3,       101, 145, 311,      'VC'     , -1, 0,    'R55',  0
'116  494319AK',        23834856,    192,  20,    2, 2,       103, 130, 262,      'VC'     , -1, 0,    'R56',  0
'117  494319CJ',        28485084,    205,  16,    2, 2,       108, 137, 256,      'VC'     , -1, 0,    'R56',  0
'118  494319BA',        26655708,    202,  20,    2, 2,       112, 138, 266,      'VC'     , -1, 0,    'R56',  0
'119  494319CC',        21423756,    200,  10,    2, 2,       108, 136, 251,      'VC'     , -1, 0,    'R56',  0
'120  494319NP',        9869304,     201,  16,    2, 2,       117, 185, 203,      'VC'     , -1, 0,    'R56',  0
'121  494319BC',        24378504,    201,  20,    2, 2,       118, 136, 264,      'VC'     , -1, 0,    'R57',  0
'122  494319BJ',        53759472,    395,  29,    3, 3,       114, 131, 294,      'VC'     , -1, 0,    'R57',  0
'123  494319AB',        23309316,    200,  1,     3, 3,       109, 130, 271,      'VC'     , -1, 0,    'R57',  0
'124  494319BK',        58045452,    393,  23,    3, 3,       106, 125, 393,      'VC'     , -1, 0,    'R57',  0
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'125  494319DC',        107215296,   620,  30,    2, 2,      115, 135, 405,     'VC'     , -1, 0,    'R58',  0
'126  494330012750',    137808,      54,  1,     15, 1,     82, 102, 131,      'VC'     , -1, 0,    'R58',  0
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'128  494330012730',    811000,      50,  1,     15, 1,     70, 140, 175,      'VC'     , -1, 0,    'R58',  0
'129  494330012720',    567552,      90,  2,     15, 1,     88, 139, 147,      'VC'     , -1, 0,    'R58',  0
'130  494330012700',    385536,      57,  2,     15, 1,     61, 79, 118,       'VC'     , -1, 0,    'R59',  0
'131  494330012690',    386052,      50,  2,     15, 1,     69, 90, 127,       'VC'     , -1, 0,    'R59',  0
'132  494330012680',    500856,      50,  2,     1, 1,      65, 92, 127,       'VC'     , -1, 0,    'R59',  0
'133  494330012670',    641976,      49,  1,     15, 1,     68, 76, 146,       'VC'     , -1, 0,    'R59',  0
'134  494330012660',    74736,       79,  2,     2, 2,      70, 110, 131,      'VC'     , -1, 0,    'R59',  0
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'139  494330012540',    201228,      100,  2,    1, 1,      72, 269, 299,      'VN', -1, 1,         'R59',  0
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'141  494330012560',    107016,      50,  1,     2, 2,      70, 284, 303,      'VN', -1, 1,         'R59',  0
'142  494330012570',    96276,       100,  1,    2, 2,      75, 283, 335,      'VN', -1, 1,         'R59',  0
'143  494330012650',    530280,      74,  3,     2, 2,      72, 97, 160,       'VC', -1, 0,         'R59',  0
'144  494330012640',    76620,       51,  2,     1, 1,      71, 117, 145,      'VC', -1, 0,         'R59',  0
'145  494330012580',    217932,      50,  1,     1, 1,      86, 284, 330,      'VN', -1, 1,         'R59',  0
'146  494330012630',    380652,      49,  2,     1, 1,      77, 91, 128,       'VC', -1, 0,         'R59',  0
'147  494330012590',    95592,       100,  2,    1, 1,      79, 283, 307,      'VN', -1, 1,         'R59',  0
'148  494330012620',    381324,      52,  2,     15, 1,     57, 124, 161,      'VC', -1, 0,         'R59',  0
'149  494330012600',    61476,       50,  1,     1, 1,      80, 312, 344,      'VN', -1, 1,         'R59',  0
'150  494330012614',    437880,      50,  2,     15, 1,     58, 88, 143,       'VC', -1, 0,         'R59',  0
'151  494330012610',    153948,      100,  1,    15, 1,     58, 314, 356,      'VN', -1, 1,         'R59',  0
'152  494330012840',    176748,      100,  2,    1, 1,      74, 191, 203,      'VC', -1, 0,         'R59',  0
'153  494330012830',    69492,       52,  1,     1, 1,      75, 106, 139,      'VC', -1, 0,         'R59',  0
'154  494330012820',    0,           52,  2,     1, 1,      76, 134, 170,      'VC', -1, 0,         'R59',  0
'155  494330012810',    78972,       44,  2,     15, 1,     86, 120, 155,      'VC', -1, 0,         'R59',  0
'156  494330012800',    514152,      52,  2,     1, 1,      86, 126, 170,      'VC', -1, 0,         'R59',  0
'157  494330012790',    293640,      50,  2,     1, 1,      101, 134, 198,     'VC', -1, 0,         'R59',  0
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'164  494330011971',    80076,       100,  1,    1, 1,      84, 276, 326,      'VN', -1, 1,         'R59',  0
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'158  494330012780',    285120,      50,  2,     1, 1,      99, 133, 171,      'VC', -1, 0,         'R60',  0
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'169  494330012870',    96168,       54,  2,     15, 1,     67, 92, 145,       'VC', -1, 0,         'R60',  0
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'174  494330012920',    112848,      56,  2,     2, 2,      66, 91, 140,       'VC', -1, 0,         'R60',  0
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'190  494330012970',    50556,     50,  1,     2, 2,    100, 140, 169,    'VC', -1, 0,    'R61',  0
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'242  494330013300',    140172,     50,  2,      2, 2,      85, 110, 160,      'VC', -1, 0,      'R63',  0
'243  494330013290',    189012,     50,  2,      1, 1,      80, 130, 170,      'VC', -1, 0,      'R63',  0
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'280  494331010240',    21876,      51,  1,      10, 1,     85, 191, 213,      'VN', -1, 1,      'R66',  0
'281  494331010230',    54336,      58,  1,      10, 1,     85, 191, 238,      'VN', -1, 1,      'R66',  0
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'287  494331010010',     660960,     78,  2,      10, 1,      100, 202, 230,     'VN', -1, 1,        'R66',  0
'288  494331AB',         4853808,    164,  8,     10, 1,      100, 213, 308,     'VN', -1, 1,        'R67',  0
'289  494331AA',         13996944,   125,  18,    10, 1,      125, 245, 293,     'VN', -1, 1,        'R67',  0
'290  494331000010',     129780,     2381,  2,    10, 1,      150, 291, 307,     'VN', -1, 1,        'R67',  0
'291  504201280280',     12727944,   320,  13,    10, 1,      135, 226, 348,     'VN', -1, 1,        'R69',  0
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'293  504201330060',     255516,     320,  2,     10, 1,      130, 310, 350,     'VN', -1, 1,        'R70',  0
'294  504201000050',     0,          975,  1,     10, 1,      130, 201, 202,     'VN', -1, 1,        'R70',  0
'295  504201060130',     324732,     73,  3,      10, 1,      110, 219, 299,     'VN', -1, 1,        'R71',  0
'296  504201060120',     389712,     73,  3,      10, 1,      95, 220, 257,      'VN', -1, 1,        'R71',  0
'297  504201060091',     5623980,    208,  10,    10, 1,      100, 218, 287,     'VN', -1, 1,        'R71',  0
'298  504201060010',     1540488,    104,  3,     10, 1,      105, 214, 301,     'VN', -1, 1,        'R71',  0
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'304  504201050020',     499524,     99,  3,      10, 1,      85, 189, 328,      'VN', -1, 1,        'R72',  0
'305  504201050030',     604932,     97,  4,      10, 1,      95, 188, 322,      'VN', -1, 1,        'R72',  0
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'308  504201040080',     1221960,    191,  3,     10, 1,      75, 177, 288,      'VN', -1, 1,        'R72',  0
'309  504201040710',     1580880,    153,  5,     10, 1,      75, 201, 250,      'VN', -1, 1,        'R72',  0
'310  504201160220',     1604172,    168,  4,     10, 1,      80, 182, 331,      'VN', -1, 1,        'R72',  0
'311  504201PX',         4457244,    167,  11,    10, 1,      85, 200, 259,      'VN', -1, 1,        'R73',  0
'312  504212100950',     10825000,   280,  12,    10, 1,      70, 175, 300,      'VN', -1, 1,        'R73',  0
'313  504212100790',     11894424,   200,  10,    10, 1,      80, 175, 215,      'VN', -1, 1,        'R73',  0
'546  504212100800',     0,          100,  1,     10, 1,      80, 335, 340,      'VN', -1, 1,        'R73',  0
'547  504212100870',     348912,     90,  2,      10, 1,      80, 330, 360,      'VN', -1, 1,        'R73',  0
'  A1A Road',            95000,      200,  1,     10, 1,      150, 151, 201,     'PC', -1, 0,        'R64',  1
'  A1A Road',            142500,     300,  1,     10, 1,      105, 106, 156,     'PC', -1, 0,        'R64',  1
'  A1A Road',            142500,     300,  1,     10, 1,      100, 101, 151      'PC', -1, 0,        'R64',  1
'  A1A Road',            130625,     275,  1,     10, 1,      90, 91, 141,       'PC', -1, 0,        'R65',  1
'  A1A Road',            294500,     620,  1,     10, 1,      85, 86, 136,       'PC', -1, 0,        'R65',  1
'  A1A Road',            166250,     350,  1,     10, 1,      125, 126, 176,     'PC', -1, 0,        'R66',  1
'  A1A Road',            997500,     2100,  1,    10, 1,      140, 141, 191,     'PC', -1, 0,        'R67',  1
'  A1A Road',            451250,     950,  1,     10, 1,      125, 126, 176,     'PC', -1, 0,        'R70',  1
'  A1A Road',            83125,      175,  1,     10, 1,      115, 116, 166,     'PC', -1, 0,        'R70',  1
'  A1A Road',            439375,     925,  1,     10, 1,      105, 106, 156,     'PC', -1, 0,        'R71',  1
'  A1A Road',            553375,     1165,  1,    10, 1,      85, 86, 136,       'PC', -1, 0,        'R72',  1
'  A1A Road',            415625,     875,  1,     10, 1,      75, 76, 126,       'PC', -1, 0,        'R73',  1
'715  Cross St.',        40000,      40,  1,      15, 1,      110, 225, 450,     'PC', -1, 0,        'R58',  1
'716  Cross St.',        40000,      30,  1,      10, 1,      140, 200, 425,     'PN', -1, 1,        'R64',  1
'717  Cross St.',        40000,      20,  1,      10, 1,      110, 190, 415,     'PN', -1, 1,        'R64',  1
'718  Cross St.',        40000,      20,  1,      10, 1,      100, 180, 405      'PN', -1, 1,        'R65',  1
'719  Cross St.',        40000,      20,  1,      10, 1,      85, 170, 395,      'PN', -1, 1,        'R65',  1
'720  Cross St.',        40000,      20,  1,      10, 1,      90, 170, 395,      'PN', -1, 1,        'R65',  1
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'723  Cross St.',        40000,      20,  1,      10, 1,      80, 160, 385,      'PN', -1, 1,      'R66',  1
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'725  Cross St.',        75000,      120,  1,     10, 1,      135, 230, 455,     'PN', -1, 1,      'R69',  1
'726  Cross St.',        40000,      30,  1,      10, 1,      135, 225, 450,     'PN', -1, 1,      'R70',  1
'727  Cross St.',        40000,      50,  1,      10, 1,      100, 190, 415,     'PN', -1, 1,      'R71',  1
'728  Cross St.',        40000,      40,  1,      10, 1,      100, 190, 415,     'PN', -1, 1,      'R71',  1
'729  Cross St.',        40000,      40,  1,      10, 1,      100, 190, 415,     'PN', -1, 1,      'R71',  1
'730  Cross St.',        40000,      60,  1,      10, 1,      85, 200, 425,      'PN', -1, 1,      'R72',  1
'731  Cross St.',        40000,      40,  1,      10, 1,      90, 180, 405,      'PN', -1, 1,      'R72',  1
'732  Cross St.',        40000,      40,  1,      10, 1,      85, 170, 395,      'PN', -1, 1,      'R72',  1
'733  Cross St.',        40000,      60,  1,      10, 1,      70, 170, 395,      'PN', -1, 1,      'R72',  1
'734  Cross St.',        40000,      60,  1,      10, 1,      75, 170, 395,      'PN', -1, 1,      'R73',  1
'735  Cross St.',        40000,      40,  1,      10, 1,      80, 175, 400,      'PN', -1, 1,      'R73',  1
'736  Cross St.',        40000,      40,  1,      10, 1,      70, 170, 395,      'PN', -1, 1,      'R73',  1
'  Road',                115000,     575,  1,     1, 1,       78, 255, 265,      'PN', -1, 1,      'R58',  1
'  Road',                590000,     2950,  1,    1, 1,       65, 255, 265,      'PN', -1, 1,      'R59',  1
'  Road',                150000,     750,  1,     1, 1,       80, 240, 250,      'PN', -1, 1,      'R62',  1
'  Road'                 110000,     550,  1,     1, 1,       65, 240, 250,       PN', -1, 1,      'R63',  1
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10.0   11.0   12.0   13.0   14.0   15.0
16.0   17.0   18.0   19.0   20.0   21.0
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'DUMMY                      ',   0 ,   0 ,   1 ,1.00        7
'DUMMY                      ',   0 ,   0 ,   1 ,1.00        8
'DUMMY                      ',   0 ,   0 ,   1 ,1.00        9
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'DUMMY                      ',   0 ,   0 ,   0 ,0.00       12
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'DUMMY                      ',   0 ,   0 ,   1 ,1.00       14
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'306  504201040050',    887280,     100,  4,    10, 1,     90, 186, 311,     'VN', -1, 1,     'R72',  0
'307  504201040070',    1555776,    104,  4,    10, 1,     90, 202, 330,     'VN', -1, 1,     'R72',  0
'308  504201040080',    1221960,    191,  3,    10, 1,     75, 177, 288,     'VN', -1, 1,     'R72',  0
'309  504201040710',    1580880,    153,  5,    10, 1,     75, 201, 250,     'VN', -1, 1,     'R72',  0
'310  504201160220',    1604172,    168,  4,    10, 1,     80, 182, 331,     'VN', -1, 1,     'R72',  0
'311  504201PX',        4457244,    167,  11,   10, 1,     85, 200, 259,     'VN', -1, 1,     'R73',  0
'312  504212100950',    10825000,   280,  12,   10, 1,     70, 175, 300,     'VN', -1, 1,     'R73',  0
'313  504212100790',    11894424,   200,  10,   10, 1,     80, 175, 215,     'VN', -1, 1,     'R73',  0
'546  504212100800',    0,          100,  1,    10, 1,     80, 335, 340,     'VN', -1, 1,     'R73',  0
'547  504212100870',    348912,     90,  2,     10, 1,     80, 330, 360,     'VN', -1, 1,     'R73',  0
'  A1A Road',           553375,     1165,  1,   10, 1,     85, 86, 136,      'PC', -1, 0,     'R72',  1
'  A1A Road',           415625      875,  1,    10, 1,     75, 76, 126,      'PC', -1, 0      'R73',  1
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'730  Cross St.'      40000,      60,  1,      10, 1,      85, 200, 425,      'PN', -1, 1,      'R72',  1
'731  Cross St.',     40000,      40,  1,      10, 1,      90, 180, 405,      'PN', -1, 1,      'R72',  1
'732  Cross St.',     40000,      40,  1,      10, 1,      85, 170, 395,      'PN', -1, 1,      'R72',  1
'733  Cross St.',     40000,      60,  1,      10, 1,      70, 170, 395,      'PN', -1, 1,      'R72',  1
'734  Cross St.',     40000,      60,  1,      10, 1,      75, 170, 395,      'PN', -1, 1,      'R73',  1
'735  Cross St.',     40000,      40,  1,      10, 1,      80, 175, 400,      'PN', -1, 1,      'R73',  1
'736  Cross St.',     40000,      40,  1,      10, 1,      70, 170, 395,      'PN', -1, 1,      'R73',  1
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SUB-APPENDIX C-2

ANNUAL RECREATION BENEFIT ANALYSIS SUMMARY FOR

SEGMENT II
POMPANO BEACH TO LAUDERDALE-BY-THE-SEA (FEDERAL PROJECT)
FORT LAUDERDALE (MODIFICATION TO FEDERAL PROJECT)

Sub Appendix Table C-2-1

Combined Reevaluation and Modification of the Federal Project Pompano Beach/LBTS

Project Year	Pompano Beach/ LBTS		Ft. Lauderdale	
	Recreational Benefit	Present Worth at Base Year	Recreational Benefit	Present Worth at Base Year
1	$3,110,406	$3,110,406		
2	$3,697,085	$3,483,708		
3	$4,283,764	$3,803,559		
4	$4,870,443	$4,074,885		
5	$5,457,123	$4,302,223		
6	$6,043,802	$4,489,745		
7	$6,630,481	$4,641,291		
8	$7,217,160	$4,760,389		
9	$7,803,839	$4,850,279		
10	$8,390,519	$4,913,936		
11	$8,977,198	$4,954,088		
12	$9,162,226	$4,764,379		
13	$9,347,254	$4,580,065		
14	$9,532,283	$4,401,156		
15	$9,717,311	$4,227,643		
16	$9,902,340	$4,059,497		
17	$10,087,368	$3,896,679		
18	$10,272,396	$3,739,132		
19	$10,457,425	$3,586,791		
20	$10,642,453	$3,439,580		
21	$10,827,481	$3,297,413		
22	$11,011,704	$3,159,968		
23	$11,195,926	$3,027,405		
24	$11,380,148	$2,899,618		
25	$11,564,371	$2,776,496		
26	$11,748,593	$2,657,928		
27	$11,932,815	$2,543,798		
28	$12,117,038	$2,433,988		
29	$12,301,260	$2,328,380		
30	$12,485,483	$2,226,855		
31	$12,669,705	$2,129,293		
32	$12,761,627	$2,020,958		
33	$12,853,549	$1,918,035		
34	$12,945,470	$1,820,261		
35	$13,037,392	$1,727,384		
36	$13,129,314	$1,639,164		
37	$13,221,236	$1,555,374		
38	$13,313,158	$1,475,795		
39	$13,405,080	$1,400,221		
40	$13,497,001	$1,328,455		
41	$13,588,923	$1,260,309		
42	$13,639,872	$1,192,023		
43	$13,690,821	$1,127,421		
44	$13,741,769	$1,066,305		
45	$13,792,718	$1,008,488		
46	$13,843,666	$953,794		
47	$13,894,615	$902,053		
48	$13,945,564	$853,108		
49	$13,996,512	$806,808		
50	$14,047,461	$763,010		
Total		$138,379,538		
Total Base Year Worth	$138,379,538			
Annualized Total Benefit	**$8,932,950**			
Interest Rate	6.125%			

Sub Appendix Table C-2-1 (continued)

Combined Reevaluation and Modification of the Federal Project Pompano Beach/LBTS

YEAR	Number of Visitors due to project	Recreational Benefit
1970	795,500	$3,110,406
1971	945,546	$3,697,085
1972	1,095,592	$4,283,764
1973	1,245,638	$4,870,443
1974	1,395,684	$5,457,123
1975	1,545,729	$6,043,802
1976	1,695,775	$6,630,481
1977	1,845,821	$7,217,160
1978	1,995,867	$7,803,839
1979	2,145,913	$8,390,519
1980	2,295,959	$8,977,198
1981	2,343,280	$9,162,226
1982	2,390,602	$9,347,254
1983	2,437,924	$9,532,283
1984	2,485,246	$9,717,311
1985	2,532,568	$9,902,340
1986	2,579,889	$10,087,368
1987	2,627,211	$10,272,396
1988	2,674,533	$10,457,425
1989	2,721,855	$10,642,453
1990	2,769,177	$10,827,481
1991	2,816,292	$11,011,704
1992	2,863,408	$11,195,926
1993	2,910,524	$11,380,148
1994	2,957,640	$11,564,371
1995	3,004,755	$11,748,593
1996	3,051,871	$11,932,815
1997	3,098,987	$12,117,038
1998	3,146,102	$12,301,260
1999	3,193,218	$12,485,483
2000	3,240,334	$12,669,705
2001	3,263,843	$12,761,627
2002	3,287,353	$12,853,549
2003	3,310,862	$12,945,470
2004	3,334,371	$13,037,392
2005	3,357,881	$13,129,314
2006	3,381,390	$13,221,236
2007	3,404,900	$13,313,158
2008	3,428,409	$13,405,080
2009	3,451,919	$13,497,001
2010	3,475,428	$13,588,923
2011	3,488,458	$13,639,872
2012	3,501,489	$13,690,821
2013	3,514,519	$13,741,769
2014	3,527,549	$13,792,718
2015	3,540,580	$13,843,666
2016	3,553,610	$13,894,615
2017	3,566,640	$13,945,564
2018	3,579,671	$13,996,512
2019	3,592,701	$14,047,46[illegible]
2020	3,605,731	
VALUE PER VISIT		$3.91

Sub Appendix Table C-2-2

Combined Reevaluation and Modification of the Federal Project
Ft. Lauderdale Recreational Benefits

Project Year	Pompano Beach/ LBTS		Ft. Lauderdale	
	Recreational Benefit	Present Worth at Base Year	Recreational Benefit	Present Worth at Base Year
1			$700,210	$700,210
2			$846,453	$797,600
3			$992,696	$881,416
4			$1,138,939	$952,900
5			$1,285,181	$1,013,196
6			$1,431,424	$1,063,359
7			$1,577,667	$1,104,356
8			$1,723,910	$1,137,079
9			$1,870,153	$1,162,346
10			$2,016,802	$1,181,147
11			$2,163,452	$1,193,906
12			$2,310,101	$1,201,258
13			$2,456,751	$1,203,784
14			$2,603,401	$1,202,018
15			$2,750,050	$1,196,445
16			$2,896,700	$1,187,512
17			$3,043,349	$1,175,624
18			$3,189,999	$1,161,153
Total				$19,515,309
Total Base Year Worth	$19,515,309			
Annualized Total Benefit	**$1,819,322**			
Interest Rate	6.125%			

Sub Appendix Table C-2-2 (continued)

Combined Reevaluation and Modification of the Federal Project
Ft. Lauderdale Recreational Benefits

YEAR	Number of Visitors due to project	Recreational Benefit
2002	179,082	$700,210
2003	216,484	$846,453
2004	253,886	$992,696
2005	291,289	$1,138,939
2006	328,691	$1,285,181
2007	366,093	$1,431,424
2008	403,495	$1,577,667
2009	440,898	$1,723,910
2010	478,300	$1,870,153
2011	515,806	$2,016,802
2012	553,312	$2,163,452
2013	590,819	$2,310,101
2014	628,325	$2,456,751
2015	665,831	$2,603,401
2016	703,338	$2,750,050
2017	740,844	$2,896,700
2018	778,350	$3,043,349
2019	815,857	$3,189,999
2020	853,363	
VALUE PER VISIT		$3.91

POMPANO BEACH/LAUDERDALE-BY-THE-SEA

RISK & UNCERTAINTY INPUT DATA FILE

```
"Uncertainties Broward COunty Segment II - Pompano Beach/LBTS"
3.6,"Shorelien position sd"
.100,"Armor cost uncertainty at 95% confidence limit"
.100,"structure value cost uncertainty"
1.0,"sd of setback distance"
.22,"sd of backfill cost per ft^3"
8,"# of storm probablilties"
61
47
46
23
18
6
2
1
1,22,36
2,41,69
3,55,91
4,0,0
5,0,0
6,0,0
7,0,0
8,0,0
9,0,0
10,4,6
11,0,0
12,0,0
13,41,69
14,0,0
15,0,0
16,0,0
9999,9999,9999
```

FORT LAUDERDALE

RISK & UNCERTAINTY INPUT DATA FILE

```
'Uncertainties Broward COunty Segment II - Ft Lauderdale"
1.8,"Shorelien position sd"
.100,"Armor cost uncertainty at 95% confidence limit"
.100,"structure value cost uncertainty"
1.0,"sd of setback distance"
.22,"sd of backfill cost per ft^3"
8,"# of storm probablilties"
36
31
33
33
37
7
5
3
1,14,24
2,23,39
3,34,56
4,0,0
5,0,0
6,0,0
7,0,0
8,0,0
9,0,0
10,4,6
11,0,0
12,0,0
13,23,39
14,0,0
15,0,0
16,0,0
9999,9999,9999
```